9/870235

Refine Search

Search Results -

Terms	Documents
L27 and (rental with period)	1

Database:
US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
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EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L28

Refine Search | Recall Text | Clear | Interrupt

Search History

DATE: Saturday, June 11, 2005 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
DB=PGPB,USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L28	L27 and (rental with period)	1	L28
L27	L26 and destination and position	6	L27
L26	L25 and record$	12	L26
L25	L24 and gps	12	L25
L24	L23 not l22	28	L24
L23	L20 and (damag$ and accident$)	30	L23
L22	L21 and (damag$ and accident$)	2	L22
L21	L20 and (car$ near4 condition)	5	L21
L20	L12 and (rental$ with facilit$)	256	L20
L19	L18 and l2	1	L19
L18	L17 and (computer and (wireless$ or "wire-less"))	14	L18
L17	L16 and condition$	15	L17
L16	L15 and (receipt$ and (calculat$ with charge))	19	L16
L15	L14 and navigat$	1315	L15

L14	L13 and @ad<=20010530	2301	L14
L13	L12 and gps$	5848	L13
L12	car$ and (rent$ or leas$)	180130	L12
DB=USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L11	L1 and blue$	1	L11
L10	L6 and blue$	1	L10
L9	L6 and bluetooth	0	L9
L8	L6 and rf$	0	L8
L7	L6 and rf	0	L7
L6	6825209.pn.	1	L6
L5	L3 and (rf)	0	L5
L4	L3 and (rf with standard)	0	L4
L3	L2 or l1	1	L3
L2	6850209.pn.	1	L2
L1	6850209.pn.	1	L1

END OF SEARCH HISTORY

L22: Entry 1 of 2 File: PGPB Dec 5, 2002

PGPUB-DOCUMENT-NUMBER: 20020184062
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020184062 A1

TITLE: Vehicle management system

PUBLICATION-DATE: December 5, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
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APPL-NO: 09/ 870235 [PALM]
DATE FILED: May 30, 2001

INT-CL: [07] G06 F 17/60

US-CL-PUBLISHED: 705/7
US-CL-CURRENT: 705/7

REPRESENTATIVE-FIGURES: 2

ABSTRACT:

A vehicle management method and system is able to monitor and manage a fleet of vehicles with high efficiency and low cost. The management method includes the steps of providing a radio transmitter connected to a vehicle navigation system in each vehicle, providing a radio transmitter connected to a facility computer in a vehicle management facility, receiving information regarding use of a vehicle by the vehicle navigation system from the facility computer which is transmitted through the radio transmitters, monitoring usage of the vehicle and storing data thereof in a memory, and sending the stored data to the facility computer through the radio transmitters.

L28: Entry 1 of 1 File: PGPB Dec 12, 2002

PGPUB-DOCUMENT-NUMBER: 20020186144
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020186144 A1

TITLE: System and method for automating a vehicle rental process

PUBLICATION-DATE: December 12, 2002

INVENTOR-INFORMATION:

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APPL-NO: 10/ 137878 [PALM]
DATE FILED: May 1, 2002

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	DOC-ID	APPL-DATE
CA	2,345,857	2001CA-2,345,857	May 1, 2001

INT-CL: [07] H04 Q 1/00

US-CL-PUBLISHED: 340/825.28; 340/901, 340/5.2
US-CL-CURRENT: 340/825.28; 340/5.2, 340/901

REPRESENTATIVE-FIGURES: 1

ABSTRACT:

The present invention concerns an automated vehicle rental system for a fleet of rental vehicles, where the vehicles are geographically distributed and normally locked when not rented. At least one of the vehicles, when not in use, is parked in an unguarded location. The system has a vehicle communications unit for enabling communication to and from the vehicle, user-carried electronic devices, or other readers, and for interfacing with the user. An on-board unit (OBU) is located on each of the vehicles for interfacing with the vehicle communications unit, and with a door unlocking mechanism. The system further has a central reservations, management and location system (CRMLS) in communication through a communications network with each OBU, the CRMLS performing all reservations and management functions, and being linked to a database containing a location and availability of each of thr vehicles and a rate for rental, the CRMLS also being provided with an

allocation manager system for geographically allocating vehicles. In order to access the vehicle, the system also includes a key being borne by the user. The system minimizes the human intervention in the rental process, and is more user-friendly.

Previous Doc Next Doc Go to Doc#

core 9/870235

L28: Entry 1 of 1 File: PGPB Dec 12, 2002

DOCUMENT-IDENTIFIER: US 20020186144 A1
TITLE: System and method for automating a vehicle rental process

Abstract Paragraph:
The present invention concerns an automated vehicle rental system for a fleet of rental vehicles, where the vehicles are geographically distributed and normally locked when not rented. At least one of the vehicles, when not in use, is parked in an unguarded location. The system has a vehicle communications unit for enabling communication to and from the vehicle, user-carried electronic devices, or other readers, and for interfacing with the user. An on-board unit (OBU) is located on each of the vehicles for interfacing with the vehicle communications unit, and with a door unlocking mechanism. The system further has a central reservations, management and location system (CRMLS) in communication through a communications network with each OBU, the CRMLS performing all reservations and management functions, and being linked to a database containing a location and availability of each of thr vehicles and a rate for rental, the CRMLS also being provided with an allocation manager system for geographically allocating vehicles. In order to access the vehicle, the system also includes a key being borne by the user. The system minimizes the human intervention in the rental process, and is more user-friendly.

Summary of Invention Paragraph:
[0001] The present invention relates to the field of telematics systems applied to the movement of goods and people. More particularly, it relates to the automation of the vehicle rental process within a wide mobility network.

Summary of Invention Paragraph:
[0002] From as far back as 1967 (GB 1208791), efforts have been made to automate the vehicle rental activity usually with an intent to provide better service, improve productivity and favor the emergence of new forms of urban mobility. However, the process of renting a vehicle from start to finish is relatively complex by nature: it involves assets of high value, complex behaviors on the part of users and significant safety or security issues. All of these factors contribute to the difficulty of automating the entire vehicle rental process reliably.

Summary of Invention Paragraph:
[0003] New Expectations for Vehicle Rental Consumers and Governments

Summary of Invention Paragraph:
[0004] Despite of these difficulties, users have shown a need to access vehicle rental services around the clock and in an ever-increasing number of locations throughout the world while hoping to encounter as little language barriers or service incompatibility as possible in the process. Users have also expressed a desire to come in and out of vehicle rental systems swiftly, effortlessly and often with little or no advance reservation. Furthermore, users have shown a growing need to access and return their rental vehicles closer to their community, workplace, transportation network or final destination; often wanting to drop-off vehicles in a different place than their departure point.

Summary of Invention Paragraph:
[0005] As a consequence, users are now expecting to rent vehicles almost on a daily basis but for very short periods of time or very short distances and to pay only for those hours of actual usage and/or actual traveled distances. Understandably, users of such short-term rental systems do not want to be burdened with time consuming refueling procedures every single time they rent a vehicle. Many users also look for ways to permanently free themselves from the costs and inconveniences that come with continuous ownership or leasing of private vehicles as the rise of carsharing clubs demonstrates.

Summary of Invention Paragraph:
[0006] Some users are looking at frequent and on-demand short-term rentals as an alternative to provide for their everyday mobility needs. This signals a departure from the prevalent mobility pattern exclusively centered on privately owned vehicles. Indeed, it is hoped that a new mobility model would enable the traveling public to combine more freely the various transportation modes during a single journey and to reduce the hassles related to parking and protecting vehicles when they are not in use. Users would then also be free to adapt the size or type of vehicle according to their travel and cargo needs through such emerging forms of individualized public transport.

Summary of Invention Paragraph:
[0007] Communities and governments have generally been very supportive of such emerging modes of vehicle rental--often called carsharing--because they can significantly reduce the impact of private vehicles on traffic congestion, the environment and transport infrastructures. Ultimately, widely available low-emission rental vehicles are considered by some as a means to encourage the combined use of public and private transportation, improve air quality, reduce parking space requirements and influence urbanization.

Summary of Invention Paragraph:
[0008] New Challenges for Providers of Rental Vehicles

Summary of Invention Paragraph:
[0009] However, from the vehicle rental service provider' point of view, the possibility of responding to this type of mobility revolution has been limited by several factors. Firstly, this form of vehicle rental generates shorter rental periods, the consequence of which are less revenue and higher transactional costs per contract. Furthermore, many locations where a need for service is currently expressed cannot be supported economically with the current art because of the combined requirements in manpower, occupancy and capital expenditures being disproportionate with the anticipated volume of activity. On-request urban mobility can also imply numerous widely dispersed service locations and unbalanced flows between those due to an increase in one-way itineraries. One-way itineraries are especially difficult to accommodate for service providers who do not have a service location at the desired destination or if vehicles from different service providers get mixed into the same fleet, a common occurrence within the road vehicle rental industry for instance.

Summary of Invention Paragraph:
[0010] Partial solutions to these difficulties have been proposed throughout the years and in particular with the advancement of telematics. For example, U.S. Pat. No. 6,006,148 proposes a method to accelerate the part of the rental process when a vehicle is returned. However valuable, such systems only apply to a relatively minor portion of the entire vehicle rental process and they are generally not designed to radically alter the cost structure or method in which vehicles are rented today.

Summary of Invention Paragraph:

[0012] In fact, it can generally be said that the prior art which relies on numerous in-vehicle sensors and customized circuitry to gather the necessary information to process a rental transaction poses significant difficulties for the majority of service providers. Indeed, the world's leading vehicle rental service providers typically hold their vehicles for less than a year. Thus, they are constantly buying and selling vehicles in order to adjust to user demand and to properly manage the quality and value of their fleet. Therefore, systems that require a great amount of cabling, calibration and skill to install generate unacceptable costs and delays to the majority of service providers. Furthermore, it is common for vehicle manufacturers to void their warranty if the electrical wiring within a vehicle has been tampered with, thus causing additional risks for the rental vehicles providers that use cabled systems.

Summary of Invention Paragraph:
[0014] It is also well known that within the vehicle rental industry hired vehicles are frequently subjected to abusive, negligent or criminal behaviors. Consequently, service providers have been reluctant to adopt systems that fail to properly address the liability, regulatory, security and safety issues associated with the vehicle rental process. For instance, some carsharing organizations have honor-based systems whereby the ignition keys for several road vehicles can be accessed at once by any of a multitude of registered members. It is a concern that within such systems, an act of theft, negligence or an equipment malfunction could have grave consequences. As a matter of fact, an increase in the level of security measures and legislation targeted at the vehicle rental activity has become noticeable over the past decade. As an example, some service providers are now installing remote tracking devices in their fleet to locate abandoned or stolen vehicles. Also, several legislatures are now requiring service providers to hold operating permits and follow mandatory procedures to reduce the risk of rental vehicles being used improperly.

Summary of Invention Paragraph:
[0015] It is also known in the road vehicle rental industry that a significant proportion of users do not report nor assume the notices for traffic violations that they receive. This in turn, results in a complicated and unaccountable rapport between vehicle rental service providers, users and the traffic violations issuing bodies.

Summary of Invention Paragraph:
[0016] It is also known within the vehicle rental industry that some users make reservations for a rental vehicle and fail to cancel them when their plans change or do not materialize. Often, some users also fail to bring rental vehicles back on due time. Additionally, it is generally believed that a minority of users causes the majority of damages on rental vehicles.

Summary of Invention Paragraph:
[0017] In all those cases, very significant costs are added to the vehicle rental activity because of many users' behavior being less than ideal. Particularly, the impact of unreliable reservations is exacerbated in short term rental systems since the same vehicle is scheduled to be rented out several times a day and since each different user is dependent on the adherence to the reservation schedule of all prior users on that day. In fact, it is very difficult for a vehicle rental service provider to accommodate such user behaviors with the prior art without being forced to reduce the utilization rates of its fleet, which in turns threatens the economic viability of short-term rental systems.

Summary of Invention Paragraph:
[0018] With the current art, most service providers also have no reliable method to encourage good behavior on the part of users apart from creating lists of unwanted users or charging penalties for lost revenue and damages at the risk of a dispute. This creates a difficult balancing act between fleet protection or utilization

objectives and good customer service, the consequences of which are lower utilization rates or overbooking risks as well as higher costs in fleet maintenance and/or damage recovery disputes.

Summary of Invention Paragraph:
[0019] It is also known in the vehicle rental industry that last minute changes are often made with regards to the class of vehicle that users will actually get compared to the class of vehicle that was reserved; this is particularly the case in the road vehicle rental market. Sometimes, such change is encouraged by the service provider to obtain more revenue on upgraded rental vehicle classes or to compensate for a shortage in one class of vehicles against another. On other occasions, users request such change to accommodate revised travel and cargo needs or as a result of a preference for a particular vehicle model. This apparently simple operation is quite difficult to automate and has so far eluded the efforts of known prior art automated systems.

Summary of Invention Paragraph:
[0020] Some other telematics systems have also combined alternative energy management with automated vehicle rental. For example, some early patents call for a vehicle rental system that requires a dedicated infrastructure for electrical battery powered vehicles. However desirable from an environmental point of view, such systems are incompatible with already deployed distribution networks of vehicle energy, i.e. mostly petroleum fuel stations. Therefore, such exclusive systems are exposed to significant acceptance delays because they are unsuited for the vast majority of road vehicles currently available and require very large infrastructure investments in new energy distribution networks.

Summary of Invention Paragraph:
[0021] Many systems also require users to pay for fuel or energy refills by themselves, to take note of such expenses, then present physical receipts and further request a credit for the unused portion of fuel or other energy. Yet, other systems require users to always fill up the vehicle with energy before returning it. However simple and inexpensive from a technology standpoint, such systems reduce the freedom, speed and efficiency of the rental experience for a user, they create substantial opportunities for unaccountable mistakes, neglect or fraud and add a significant administrative or control workload for users, service providers and third parties. It is also known that most telematics systems will be subject during the course of their useful life to some form or another of network or connectivity problem, unauthorized system tampering, obsolescence, incompatibility or other forms of process-critical issue. It is also known that real time communications between central systems and vehicles can generate significant telecommunications costs and be subject to radio-frequency interference and bandwidth or geographical limitations. For these reasons, some prior art systems that have relied exclusively on centralized information structures and intensive real-time data transfers between vehicles and base for their core operations have experienced important difficulties in actual deployment.

Summary of Invention Paragraph:
[0022] Service providers have also noted that while users appreciate methods to improve the efficiency of their vehicle rental experience, they can also become uncomfortable if the human contact is entirely lost in the process, especially when unexpected problems arise. Users also have a tendency to prefer simple technologies that can be used across several service providers, makes of vehicles and transportation networks. Difficult situations have arisen in the past with some automated vehicle rental systems that did not sufficiently take into account such human behaviors and preferences.

Summary of Invention Paragraph:
[0023] Many prior unmanned vehicle rental systems also have no fully automated reservation methods. Yet, others use reservation systems that are not fully

integrated with the actual physical moving assets; a situation which requires additional human iterations to match vehicles and which cannot provide an absolutely certain confirmation that the theoretical fleet count matches the true physical count at a given location. Others also use an automated reservation method that simply matches a reservation with a specific vehicle, indicating an available vehicle with a green light, a reserved one with a yellow light and unavailable vehicles with a red light for example. In some cases, users may have to walk from one vehicle to another in a trial and error manner or must deal with yet another equipment, such as a parking lot computer terminal or a key delivery mechanism to find a free vehicle and match it with its parked location. It is also common for many prior art systems to require users to report the parked location of a vehicle upon return, adding further delays and opportunities for errors to the rental experience. While it can be said that such systems are sufficient in locations with only a few vehicles; it is abundantly clear that they become almost impossible to administer in large rental locations where a great number of diverse vehicles are present. For example, if a user enters an unmanned location where 200 randomly parked vehicles are simultaneously present and if 199 of those vehicles are already reserved, it may become extremely frustrating to find the one available vehicle within the fleet.

Summary of Invention Paragraph:
[0024] Furthermore, it has been noted that most users feel isolated and uncertain while attempting to gain automated access to vehicles on unmanned premises. In fact, there is typically little information or no information communicated from vehicles to users while users are standing outside a vehicle and awaiting access during the initial period of the rental process.

Summary of Invention Paragraph:
[0025] In some cases, users are left wondering during several seconds if their access requests has been received, denied or is in the process of being treated while standing outside a vehicle. Such situation can lead users to abandon a first vehicle while their access request is still being processed and to try accessing another vehicle. Additionally, there has been no reliable method for users to determine with certitude which vehicles actually correspond to the class of vehicle that they have reserved when entering an unmanned rental location with a multitude of randomly-parked vehicles of various sizes and features. For example in the road vehicle rental industry, the difference between a sub-compact car and a compact car may not be obvious to the average user, causing uncertainty, delays and possible misunderstandings in the process.

Summary of Invention Paragraph:
[0026] It is also common for consumers and vehicle rental service providers to rely on a variety of worldwide, national or local automated information networks to generate or facilitate transactions between themselves. Examples of those public and private automated information networks are provided by Internet travel portals or corporate websites, travel agent networks or global distribution systems (GDS), central reservations systems (CRS), vehicle maintenance or sales networks, insurance claims processing or mass transit traveler information systems. It is also known that many public records such as motor vehicle registers are gradually becoming remotely accessible by way of computers. Prior art systems that do not provide for a sufficient interface with the above-mentioned networks are in effect disconnecting vehicle rental service providers from established information networks that are already responsible for processing billions of reservations and information updates annually.

Summary of Invention Paragraph:
[0027] It is also known that the United States of America Government has announced that it will not interfere anymore with the Global Positioning System (GPS) signal emitted by its satellites, a decision which results in a significant improvement of the accuracy of the GPS measures. It is also known that vehicle and

telecommunication equipment manufacturers have begun developing standards such as IDB, Bluetooth, LIN, Most and AMI-C that will bring about compatibility between various equipment on board vehicles regardless of their makes or functions.

Summary of Invention Paragraph:
[0028] It is also known that people who rent cars frequently need directions, up-to-date information on traffic conditions and are also big consumers of tourism and telecommunication-related services. Furthermore, it is time consuming and rather inefficient for rental vehicle providers to administer the distribution of information that is not directly relevant to the actual rental process.

Summary of Invention Paragraph:
[0029] It is also known that some of the vehicle rental automation solutions currently offered to the public require users to hold a wide variety of cards, club memberships and personal electronic devices that are subject to added costs, theft, losses and delays.

Summary of Invention Paragraph:
[0030] It is also a fact that a large proportion of users do not read the actual detailed rental agreements before signing it and accumulate a fair amount of documents, receipts and contracts through the rental process, most of which ending up as waste.

Summary of Invention Paragraph:
[0031] Thus what is needed is an integrated, universal and reliable automated vehicle rental system which can optimize the entire vehicle rental process; which is easily understandable and accessible by users; which encourages responsible behaviors and yet is not over-dependent on new infrastructure or in-vehicle investments.

Summary of Invention Paragraph:
[0032] It is therefore a main object of the present invention to bring together logical intellectual processes and practical means to enable the entire rental process to take place easily between users, vehicle rental service providers and third parties in less time, with less cost and more reliability. Third parties may include other transportation, travel, vehicle rental or information networks, regulatory entities, credit or payment facilitators or any regular participant in the vehicle rental activity.

Summary of Invention Paragraph:
[0033] It is an advantage of the present invention in that it eliminates much of the labor costs and delays throughout the entire vehicle rental process in 3 ways:

Summary of Invention Paragraph:
[0037] Especially, it enables the delegation of those tasks within the rental process that typically do not require human judgement, fail to motivate human operators, cause delays or abrupt workload fluctuations, are repetitive, are prone to error or more efficiently performed by information systems or users themselves. Therefore, it is an advantage of the invention in that it provides access to rental vehicles almost instantaneously, 24 hours a day, 7 days a week and in an economically viable manner for even the briefest of rental periods.

Summary of Invention Paragraph:
[0038] It is also an advantage of the present invention in that it eliminates much of the occupancy costs and infrastructure investments currently required to hold a vehicle rental activity such as on-site customer service facilities, expensive retail space, fenced lots, key delivery areas and so on. Therefore, it is an advantage of the present invention in that it lowers the threshold at which a rental location is economically viable and enables service providers to bring rental vehicles much closer to users in more numerous, smaller and widely dispersed

locations.

Summary of Invention Paragraph:
[0039] It is also an advantage of the present invention in that it enables an automated vehicle rental process to be held in a legally compliant, financially secure and insurable manner whereby all parties are protected from the most common forms of abusive, negligent or criminal behaviors.

Summary of Invention Paragraph:
[0040] It is also an advantage of the present invention in that it provides users with a quasi-instantaneous method to reserve, enter and exit a rental vehicle without the need for physical document manipulation, yet, still creating a legally binding rental agreement. It is also an advantage of the invention in that it provides users with clear and universal means to quickly identify available vehicles, understand the status of their vehicle access requests and identify those vehicles that belong to their preferred vehicle class. Additionally, the invention eliminates the need for vehicle allocation systems such as key delivery mechanisms and parking coordination methods to be put in place at rental locations.

Summary of Invention Paragraph:
[0042] It is also an advantage of the present invention in that it provides users and vehicle rental service providers with the ability to compatibly exchange information with third party systems such as departments of motor vehicles, travel networks, credit organizations and others.

Summary of Invention Paragraph:
[0044] It is also an advantage of the present invention in that it enables the use of one single means to identify the user, access the vehicle and pay for the fuel or energy refills in rental vehicles. Moreover, the invention eliminates the risk of error or loss as well as the additional workload that come with manual handling of receipts for energy expenses made by users.

Summary of Invention Paragraph:
[0046] It is also an advantage of the present invention in that it delegates the responsibility of summary vehicle inspection to the user and provides for a clear transfer of responsibility between the vehicle rental service provider and the user.

Summary of Invention Paragraph:
[0048] It is an advantage of the invention in that it adapts automatically to the language of the user in most circumstances and applications, providing added comfort and safety throughout the rental process.

Summary of Invention Paragraph:
[0049] It is also an advantage of the invention in that it provides for the rapid detection, tracking and resolution of problems that may have arisen with a particular user, vehicle or rental operation. The invention also enables service providers and users to efficiently communicate with each other in a multilingual and documented manner to resolve complaints or problems.

Summary of Invention Paragraph:
[0051] It is also an advantage of the present invention in that it provides users and vehicle rental service providers with the incentive and control means to balance vehicle inventories between distant locations.

Summary of Invention Paragraph:
[0052] It is also an advantage of the present invention in that it enables rental vehicles with different ownership or coming from different but compatible rental systems to mix freely within a same location as a result of one-way rental itineraries. Yet, this apparent chaos is conducted in a highly organized, legally-

compliant and accountable manner with each moving asset carefully controlled and maintained throughout its migration outside its original zone of service.

Summary of Invention Paragraph:
[0053] It is also an advantage of the present invention in that it provides users and vehicle rental service providers with the means for last minute changes in reserved vehicle class without human intervention.

Summary of Invention Paragraph:
[0055] It is an advantage of the invention in that it provides rental vehicle providers with the ability to monitor the condition of use of their vehicles and especially, to detect risky behaviors such as speeding.

Summary of Invention Paragraph:
[0056] It is an advantage of the invention in that it eases and automates the process of finding parking spaces for rental vehicles as they travel to and from rental locations.

Summary of Invention Paragraph:
[0057] It is also an advantage of the present invention in that each vehicle's on-board unit has substantial autonomy over its telematics network, providing the vehicle rental process with an increased reliability and effectively shielding the user from the most common forms of network failures.

Summary of Invention Paragraph:
[0059] In accordance with the invention, these and other objects are achieved with an automated vehicle rental system for a fleet of rental vehicles, said vehicles being geographically distributed, each of said vehicles being normally locked when not rented, at least one of said vehicles, when not in use, being parked in an unguarded location; said system comprising:

Summary of Invention Paragraph:
[0062] a central reservations, management and location system (CRMLS) in communication through a communications network with each of said OBU, said CRMLS performing all reservations and management functions, said CRMLS being linked to a database containing a location and availability of each of said vehicles and a rate for rental, said CRMLS also being provided with an allocation manager system for geographically allocating vehicles; and

Brief Description of Drawings Paragraph:
[0070] FIG. 6A is a flow-chart of updating of information regarding rental location;

Brief Description of Drawings Paragraph:
[0078] FIGS. 12A and 12B are flow-charts of a rental fleet monitoring process;

Detail Description Paragraph:
[0088] The invention is mostly related to the backbone process management of the rental activity and to some particularly avant-garde embodiments. Due to varying levels of technology acceptance, crime rates and communication capabilities throughout the world, the invention is meant to be used across various platforms and through a variety of embodiments in order to reach all users in any vehicle. In the text that follows, the invention is described using mostly road vehicles in areas with good cellular radio coverage and average crime prevalence.

Detail Description Paragraph:
[0092] Access to the Internet (1) (2) or to a dedicated computer terminal installed by a vehicle rental service provider (3) or some other similar form of data communication means.

Detail Description Paragraph:
[0098] An electronic microchip equipped card, often called smart card (4)(9), or any similar small personal electronic means that the user carries with him and where information such as secret code, names, allowed credit and preferred language or programs are stored and can be retrieved by a smart card reader or comparable apparatus. Such smart card means would typically be issued to a new user upon registration specifically for the vehicle rental activity or in other cases it may already be in the possession of a user after being issued, for example by a public transit or credit provider.

Detail Description Paragraph:
[0099] In a preferred embodiment, such smart card is contact-less and does not require any physical contact to be read by the card reader. In one preferred embodiment, said smart card is also used to perform other functions such as purchasing fuel for rental vehicles and in such case, the said smart card may also feature contact points or a magnetic stripe to be compatible with existing retail card reading devices (4).

Detail Description Paragraph:
[0108] Software to enable and control the optional use of said data/voice telecommunication system by users wanting to rent it for their own use.

Detail Description Paragraph:
[0113] Antenna (33) and receiver system to acquire and treat the signal emitted by space-borne global positioning systems (5) such as the American Government's Global Positioning System (GPS) or from other sources such as mobile radio communication networks (6).

Detail Description Paragraph:
[0115] As mentioned earlier, the invention relies on as little cabling and customized circuitry as possible in its simpler forms and can be installed in a wide variety of applications and vehicles. In its preferred embodiments for road vehicles, it has no physical customized cabling for outputs our inputs to and from the vehicle in order to enable vehicle rental service providers to quickly transfer the devices from one vehicle to another. However, the following is a list of various components that may be required:

Detail Description Paragraph:
[0124] Scanner (36). In jurisdictions where vehicle rental service providers are required to verify entitlement means such as drivers' licenses, it may be necessary to install an in-vehicle scanner for users to present and transmit their entitlement means to a remote customer response center.

Detail Description Paragraph:
[0143] Providers of insurance records or other types of public records to qualify users of the automated vehicle rental processes (51).

Detail Description Paragraph:
[0145] Insurance, vehicle repair or other referring organizations that frequently direct users to vehicle rental service providers (49).

Detail Description Paragraph:
[0146] Global Distribution Systems (GDS) (44) such as Sabre, Amadeus or similar networks that are widely used for worldwide reservations of rental vehicles or similar connectivity to Internet-based travel portals such as Travelocity.com, Expedia.com and other similar information delivery organizations.

Detail Description Paragraph:
[0149] In order for vehicle rental service providers employees to inspect vehicles and confirm their odometer reading or fuel gauge levels, a master code or a

specially programmed smart card must be issued to them to allow for certain operations to take place.

Detail Description Paragraph:
[0150] In order to ensure the proper allocation of legal responsibility when users take possession of rental vehicles in unmanned locations and through an electronic process, it is considered an enabling condition for service providers and users to agree and refer to a "general or master" rental agreement.

Detail Description Paragraph:
[0152] To enable the system to retrieve and send users' electronic messages using their preferred email address, a registering user must have the relevant information concerning said user's Internet Service Provider. For example: user id, password, mail server address, DNS, etc. Alternatively, a user can authorize the vehicle rental service provider or system manager to obtain such information on said user's behalf.

Detail Description Paragraph:
[0153] In order to assure users of the integrity of a rental process involving average speed, elapsed time or distance determination based on various equipment and logical processes, it may be required to obtain an independent certification of the data accuracy or integrity from an independent and impartial third party in some jurisdictions.

Detail Description Paragraph:
[0157] Depending on factors such as costs, location, radio spectrum availability and proximity of the Public Switched Telephone Network (PSTN) (6) in a given application, said communications between CRMLS and OBUs (35) may be advantageously carried out through an additional system component which is the local base station system (BSS) (7) (43). Said BSS can be connected to the PSTN and installed within radio frequency (RF) range of a rental location to communicate with vehicles when they are picked up or returned for example (8). A BSS is a semi-permanent apparatus comprised of a processing unit such as a portable computer connected to the CRMLS and a RF transceiver, which enables a BSS to communicate with OBUs within vehicles. It can be advantageously moved from one location to another as a vehicle rental service provider reacts to changes in its commercial environment.

Detail Description Paragraph:
[0159] The BSS can also be used advantageously within a vehicle rental network to transfer large amounts of data such as when remotely transferring maps and updating the database or software within a particular vehicle's OBU.

Detail Description Paragraph:
[0161] To also accommodate the varying priority levels of communications between the CRMLS and the OBUs, the invention provides for a combination of data and voice transmission channels, techniques and protocols to be used. In an application where a service provider would use the invention for vehicle rental activities on 5 continents for example, then a CRMLS network could be formed with 5 similar continental CRMLS interconnected by methods such as an integrated services digital network (ISDN) (41). On each continent, CRMLS and vehicles could then communicate by combining instantaneous connections for high priority content and delayed Internet-supported data transfers through a BSS for low priority information exchanges such as updating software running on the OBU of a given vehicle. According to the volume of activity and the local conditions of a given rental location, components of the system will be programmed to use the most appropriate channel within such options as ISDN, BSS connected to the PSTN or third party cellular radio networks.

Detail Description Paragraph:
[0168] The invention provides new users with means to securely, autonomously and

electronically register or update their personal information with a vehicle rental service provider, such as address, telephone number, special conditions, desired rate and incentive options, preferred vehicle class and information related to payment or entitlement means.

Detail Description Paragraph:
[0170] In a preferred embodiment, the registration is performed directly by the new user through one or several multilingual Internet sites controlled by a vehicle rental service provider or an interconnected third party. It should be noted that in its preferred embodiment, the invention does not require but still enables a human operator to intervene during the registration process. In the course of this process, the user will also be selecting a secret code and/or agreeing on some other security procedures, a cornerstone of the system protection.

Detail Description Paragraph:
[0171] As can be seen in FIG. 8A, said registration can take place from any Internet enabled device in the world including the OBU of a rental vehicle itself through a regular remote-connection or wireless Internet session with the CRMLS.

Detail Description Paragraph:
[0173] In a preferred embodiment, the invention provides new users with means to register or open an account with a vehicle rental service provider with no advanced registration whatsoever and through an immediate and direct interface with the actual vehicle that they are wanting to rent.

Detail Description Paragraph:
[0177] In a preferred embodiment, the invention provides for new users to register with a vehicle rental service provider by simply dialing a special CRMLS number advertised on a vehicle from their personal communication device or from a public phone. Said new users would then be prompted to precisely identify the vehicle they are looking to rent by entering the selected vehicle's assigned number. Said new users would then be requested to go through a minimal security procedure such as entering one verifiable information over the phone and continuing the registration session in a manner much similar to the one described in section 6.3.2. Upon successful completion, the CRMLS would then instruct the OBU to unlock the doors.

Detail Description Paragraph:
[0179] In yet another embodiment, the invention provides for users to spontaneously register by presenting a widely distributed personal electronic means already in their possession for other applications without the need to have any prior relationship with the vehicle rental service provider. Said electronic means can be a general-purpose electronic purse or a national social security smart card or a credit card equipped with a chip card for instance. After the information contained on said smart card has been verified, the new user would then be granted access to the vehicle in order to complete the registration process in a manner much similar to the one described in the previous sections.

Detail Description Paragraph:
[0181] As can be seen in FIG. 8A and before enabling a new user to actually use a rental vehicle, the system verifies that the information submitted by a particular user is correct and acceptable without or with minimal human intervention.

Detail Description Paragraph:
[0182] Depending on the level of security and credit verification desired, said verification could be more or less thorough. In a preferred embodiment, fully automated database queries are made from the CRMLS to the remote entity responsible for regulating the use of the appropriate category of vehicles in a given jurisdiction; e.g. drivers' license issuing office. Such automated verifications can confirm if the public records for a new user match or closely match the information that has been submitted and if a user is entitled to operate a given

class or form of vehicle. The system then automatically verifies that the credit card information submitted matches the information registered with the credit card issuer and that the card is valid. Upon confirmation that all information given is correctly correlated in the queried databases and/or is acceptable in relation to the service providers' system criteria, the new user ID or account number is generated.

Detail Description Paragraph:
[0184] Yet, in an even more secure embodiment and when provided with confirmation of the appropriate legal or system manager authority, the system can also automatically verify a new user's standing with various reporting entities such as credit agencies, insurance bureaus or other relevant public records (51).

Detail Description Paragraph:
[0187] If this occurs during registration, the system will then withhold the authorization to activate a new user until such manual intervention has been completed and reported back to the system or until an authorized system manager overrules the holding pattern. It is also provided that each user registration is compared with the existing database to prevent double registration or registration attempts by past users with revoked access privileges. This explanation of the verification process is only provided as an example as several different security levels and embodiments are possible to achieve comparable goals. As per current vehicle rental practices, most service providers that operate through manned retail counters are usually satisfied with semi-automated telephone credit card verifications and a visual verification of their customers' entitlement means before granting access to a vehicle.

Detail Description Paragraph:
[0190] In some jurisdictions and for some applications, the law requires that vehicle rental service providers make a visual verification of the driver's license presented by a user before granting them access to a rental vehicle. In a preferred embodiment to deal with said requirements the rental vehicle is additionally equipped with a scanner (36) and a camera (34). When a user is seated in the vehicle, he is prompted to insert a valid driver's license into the in-vehicle scanner. The picture file and the scanned document file are then sent to a customer service and response center for authorization. Said visual verification process can be added to the previously described registration processes in order to comply with said laws or to increase the security level of the rental system.

Detail Description Paragraph:
[0194] In a preferred embodiment, the internal information network is comprised of several computer servers dedicated to the vehicle rental service provider's Internet sites, DTMF (touch-tone) or interactive voice response systems (IVR) that are part of the CRMLS. Users can access said internal information network from any telephone, computer or Internet enabled device in the world including the OBU within rental vehicles.

Detail Description Paragraph:
[0197] The invention provides for optional, multilingual and automated reservations to be made and confirmed around the clock and from/to any part of the world. In a preferred embodiment, the invention provides for registered and experienced users to make basic vehicle reservations on the IVR or DTMF system. The invention also provides for registered and unregistered users to make more complex reservations over the Internet. For instance, the Internet would be the preferred reservation mode for a user wanting to reserve a special vehicle at an international rental location and to obtain a geographical map at the same time (FIG. 6A).

Detail Description Paragraph:
[0199] As can be seen in FIGS. 10A and 10B, the reservation process takes into account various elements such as user-provided duration (24), involved rental

locations, vehicle class and bookings on-hand to determine if a rental vehicle can be reserved for a user. The system also provides for standard rates to be applied to rental transactions depending on the advance notice given by the user. For instance, reservations placed 24 hours before an actual rental may be billed at a different rate than reservations placed only 1 hour prior to rental.

Detail Description Paragraph:
[0202] Some already known issues in the daily or weekly vehicle rental industry become exacerbated in the context of repetitive hourly rentals and the invention provides for added functions to address those.

Detail Description Paragraph:
[0207] The invention provides the means to rate and encourage users' compliance with the rental agreement upon which the contract is formed between service providers and users. It also encourages users to utilize the rental system frequently. In a preferred embodiment, each user is rated against factual behavior/volume criteria (BV) which are determined from a formula taking into account the number and gravity of reported incidents against a user as well as the number of times said user has rented vehicles within the system (mainly FIG. 10B and as part of several other processes).

Detail Description Paragraph:
[0210] b) users returning rental vehicles in untidy or damaged conditions

Detail Description Paragraph:
[0214] f) moving the rental vehicle outside an authorized radius (28)

Detail Description Paragraph:
[0215] The invention provides for said incidents to be marked against a user up to a certain threshold (e.g. BV=1) beyond which penalties or rate increases are applied, messages are sent or other actions may be taken automatically or manually (FIGS. 10B and 17B). Inversely, users who consistently rent vehicles with low incident occurrence can automatically receive encouragement messages and reduced rates.

Detail Description Paragraph:
[0216] To understand the vital importance of such mechanisms in an automated short-term rental system it should be understood that vehicles will normally be rented out several times a day to different users and that there is usually no technicians to verify or correct the condition of vehicles in between rentals. It is known from economic models that even marginal improvements in user compliance with reserved times as well as reductions in vehicle downtime have a very significant impact on the economic viability of a rental system. For example, it is easy to understand that important utilization losses and poor fleet planning will result for the service provider if too many users exaggerate--even by half a day only--the length of their required rental period or fail to show up for a reserved vehicle. It is also obvious that important shortages, customer complaints and poor fleet planning will result if vehicles fail to return within the expected rental duration, if they are returned at the wrong location or unfit to be rented again as a result of careless behaviors.

Detail Description Paragraph:
[0217] 6.5.3 Providing Users with Information on Rental Locations (FIG. 6A)

Detail Description Paragraph:
[0218] With the help of various means, such as voice instructions over IVR and/or DTMF systems and Internet sites, the user is able to find any rental location in the system register and obtain related maps, directions and link to services.

Detail Description Paragraph:

[0219] As was seen previously, said locations require no or very little infrastructure to enable vehicle rental service providers to create, modify or remove a rental location at very little cost in order to respond to varying market or seasonal conditions or other. In order to ensure that users affected by such changes are kept informed the invention provides for an automated diffusion of the information to relevant users when the location register is updated. As an example, relevant users may be defined as those having chosen the location being modified as their default location or users having used said location in the past.

Detail Description Paragraph:
[0224] As can be seen from the various processes, a reservation made by a user can cause the system to refuse other reservations or proceed to vehicle relocations within the network. As a result, lost opportunities and unnecessary costs can be incurred when users fail to use their reservations and neglect to modify or cancel them. Therefore, the system can automatically bill and update behavior/volume ratings for users who have failed to use their reservations after a system manager defined grace period has expired. Said billing can be established based on past user track record as can be seen in FIG. 13A.

Detail Description Paragraph:
[0226] It is provided that users may call or log into the system at any time to modify a reservation. For instance, such communication may be established directly from an OBU in a rental vehicle, an Internet-enabled device or a telephone. It is also provided that said modification can generate fees if it is made beyond a certain system-manager defined advance notice period and if the vehicle rental service provider chooses such option. FIG. 13B provides an example of such process.

Detail Description Paragraph:
[0227] 6.6 Processes Prior to the Vehicle Rental

Detail Description Paragraph:
[0228] 6.6.1 Random Allocation of Rental Vehicles (FIG. 6B)

Detail Description Paragraph:
[0229] In a preferred embodiment, vehicles are allowed to park at random to maximize the utilization of space and a pictogram (14) or message display (15) visible from outside the vehicle informs the user or passerby if a vehicle is available. No specific vehicle is allocated to a given reservation and reservations are treated on the basis of the vehicle class (see sections 6.8 and 7.1 for exceptions to this rule). Therefore, all vehicles within a same class at a given location are shown as available as long as there is still at least 1 vehicle available for rent (See FIG. 6B). In this manner, users can enter a parking area in no particular order and choose the vehicle that is most conveniently located or that best corresponds to their taste of the moment.

Detail Description Paragraph:
[0230] Said pictogram (14) or side-window display (15) can also be used to communicate various other information before a user accesses a vehicle such as applicable rental conditions, available services, maximum rental period allowed, one-way trip availability, equipment on board and so on.

Detail Description Paragraph:
[0231] It should be noted that the above-described allocation process does not apply to one-way inter-city rentals (6.8.8) or automated inspection scheduling of vehicles on sale (7.1.5) and that in such particular cases, a specific vehicle may be allocated to a specific user.

Detail Description Paragraph:
[0233] In most applications, the system deals with numerous retail users of varying

creditworthiness and from which payment must be secured before granting access to a vehicle in order to protect vehicle rental service providers. Also, instruments such as credit cards and access cards can be stolen from users and it is important to prevent vehicles from being entered by illegitimate card bearers. FIG. 12A shows how such verification is made when users have an advance booking or FIG. 11A in the case of a spontaneous rental. As can be seen from FIG. 12A and in the case when the system is unable to secure payment from a user holding a reservation, said user will be notified in advance and will have an opportunity to rectify the situation.

Detail Description Paragraph:
[0234] 6.6.3 System-prompted Modifications to the Demand for Rental Vehicles

Detail Description Paragraph:
[0235] As indicated, vehicle rental systems are subject to sudden peaks in demand. As can be seen in FIG. 16A, shortages may easily occur at one rental station (Station B at period 4 in this example) even if there are several unused vehicles elsewhere in the network.

Detail Description Paragraph:
[0236] Since users come to depend very much on said rental systems, they may suffer significant consequences when a reservation is not honored or when a vehicle cannot be rented spontaneously at their preferred location. Thus, there is a benefit in optimizing the management of this process.

Detail Description Paragraph:
[0238] Therefore, it is provided that the CRMLS constantly monitors the rental fleet and automatically communicates with the relevant group of users in order to provide advance warning and modify the demand for vehicles when facing an actual or imminent vehicle imbalance in the network. FIG. 12B provides an illustration of the following examples:

Detail Description Paragraph:
[0242] The system-prompted modifications here described can be summarized as an attempt to reduce the gap between demand and offer by making modifications in the demand pattern for rental vehicles. As will be seen further, other methods are also used to reduce said gap by making modifications in the offer pattern for rental vehicles. Although voluntary modifications to reservations represent an inconvenience to most users, it is believed that an incentive-based method which provides alternative options is an acceptable compromise which can substantially contribute to rental fleet optimization and overall user satisfaction.

Detail Description Paragraph:
[0243] 6.7 Processes During Vehicle Rental

Detail Description Paragraph:
[0246] It is also provided for the OBU and the CRMLS to open a communication link when a user is requesting access to a rental vehicle. This is for 2 reasons: a) to reduce the risk of illegitimate users accessing a rental vehicle and b) in order to inform the CRMLS that said rental vehicle will become engaged into a rental transaction.

Detail Description Paragraph:
[0249] Because users are often exposed to the elements while attempting to access rental vehicles and since the absence of human assistance can be intimidating at times, there is a benefit to unlock the doors of a rental vehicle as quickly as possible for legitimate users. Also, in the case where a user has already made a reservation, it is useful to spare the user from having to reenter again the information related to the rental transaction such as the drop-off time and location. Such benefits are achieved by moving most of the reservation information from the CRMLS down to the vehicle level (FIG. 11A).

Detail Description Paragraph:
[0250] As will be seen later, every time a vehicle returns to a rental location, its OBU enters into a dialogue with the CRMLS and it is provided that the system take opportunity of this communication to update both the OBU and the CRMLS. During said communication session, the CRMLS communicates the updated list of approved reservations to the relevant OBU. For example, the list of reservations for the next 24 hours at the relevant location can be stored in the OBU at that moment. As was seen in section 6.6.1, all vehicles within the same class at a given rental location should receive such reservation information since all are likely to be chosen by a reservation bearer.

Detail Description Paragraph:
[0252] 6.7.3 Access Control for Spontaneous Rental

Detail Description Paragraph:
[0253] In the case of spontaneous rental requests without prior reservations and by presenting access means such as smart cards, it is provided that the system will immediately query the CRMLS to obtain an authorization prior to granting access to a user. As explained previously, it is important for users to be kept informed of the status of their access requests during the few seconds while they wait outside a vehicle and for this reason, a pictogram display (14) or side-window display (15) will acknowledge the request in process for users' added comfort. Once the authorization has been received from the CRMLS, the doors are unlocked by the OBU (FIG. 11B).

Detail Description Paragraph:
[0254] In the case of spontaneous rental requests by using access wireless communications access means such as a mobile telephone, it is provided that the CRMLS will first conduct the verifications and then instruct the OBU of the concerned vehicle to grant access to the requesting user. During this process, the CRMLS will keep users informed as to the status of their access request via the IVR, DTMF, Internet or live operator mode that is being used.

Detail Description Paragraph:
[0256] As can be seen in FIG. 11A and in case of a network failure, it is provided that most access requests triggered by an autonomous access means such as a smart card can still be processed to prevent users from being stranded next to an inoperative rental vehicle.

Detail Description Paragraph:
[0258] 6.7.5 Moving Users to a Different Vehicle Class at the Rental Location

Detail Description Paragraph:
[0261] Prior to entering the vehicle and within the conditions of the general rental agreement, it is provided that the user is responsible for making a superficial inspection of the rental vehicle's condition. Such inspection is confirmed by the user (21) prior to transferring the legal responsibility of the vehicle. See FIG. 14A for process.

Detail Description Paragraph:
[0263] As will be seen further, the system may often use reckoning methods to determine the fuel level if a universal connection with the vehicle instruments is not available. Thus and in relevant applications, the OBU requests users to enter or confirm the fuel level and odometer reading prior to the rental vehicle being released as a verification procedure (21A). As will be seen further, such confirmation is helpful in tracking down energy-related fraud (e.g. fuel theft) and in providing a proof of the user's acceptance of the fuel quantities and distance-related charges.

Detail Description Paragraph:
[0265] Rental vehicle users are often foreign travelers who are not familiar with the language in use within a national rental system. Because users' convenience and safety very much depend on their ability to understand the rental process, get directions, abide by local regulations or obtain services while traveling, there is a great benefit to customize any user interface to their preferred language. Therefore, it is provided that the system will request users to enter their preferred language upon registration See FIG. 8A. Due to translation costs and other legal aspects, it is also provided for users to enter a second language of choice for those circumstances where delivering the service in the preferred language is not possible. Upon registration, the system will attribute a permanent language code that will always follow the user anywhere in the world thereafter. Following the system acquisition of said language code it is provided that a language code verification routine be part of any process running on any platform, system or device in order to ensure that the system always communicates with a user in his/her preferred language. See examples of said routine in FIG. 9B, FIG. 11B or FIG. 12A.

Detail Description Paragraph:
[0266] 6.7.9 Confirmation of the Rental Agreement Prior to Releasing the Vehicle

Detail Description Paragraph:
[0267] Once a user has gained access to a vehicle, it is provided that the system will prompt said user to input and/or confirm the parameters on which the rental agreement will be based such as drop-off time and location (24). Also see FIG. 14A for an example of the process.

Detail Description Paragraph:
[0272] It is standard practice for vehicle rental providers to reserve a certain monetary amount on users' credit card accounts when opening a rental agreement. Such practice serves to encourage users' compliance with the rental agreement and to avoid costly procedures to recover small amounts in the case of damages to the vehicle or other disputes. Thus, it is provided for the system to make such reserve prior to the vehicle being released and to reverse it only when the vehicle used by a given user has met certain conditions. For instance, when the vehicle provider has inspected the relevant vehicle or when said vehicle has been rented again a certain number of times or for a certain period of time with no incident being reported.

Detail Description Paragraph:
[0274] It is provided that once a reliable authentication method has been used that the user associated with said exclusive authentication becomes responsible for the vehicle (within the limits of the rental agreement) until the user has been discharged of this responsibility by another user or by the system manager. As can be seen in FIG. 11B, once a vehicle ignition has been released the OBU will establish a communication link with the CRMLS in order to update the Vehicle Inventory and Reservations register and launch the Rental Fleet Monitoring Process for the relevant vehicle.

Detail Description Paragraph:
[0275] 6.7.13 Rental Agreement on Board

Detail Description Paragraph:
[0276] Although the vast majority of users very seldom read or use rental agreements in the normal course of their rental transactions, there are circumstances where said agreements need to be produced. As an example, some jurisdictions require drivers of rented road vehicles to hold a copy of their rental agreements in case they would need to demonstrate to authorities that they have legitimate use of the rental vehicle in their possession.

Detail Description Paragraph:
[0277] In the prior art, it is most common to prepare, manipulate, print and exchange paper documents for every single transaction regardless of the fact that those documents will usually not be used and be discarded. To avoid such waste of resources, it is provided that rental agreements can be viewed on request (26) either on the OBU's display (16) or on the side-window display (15) or on a local printer within rental vehicles if appropriately equipped. To enable such localized display or printing, the CRMLS remotely downloads a template of the rental agreement into the OBU's memory and the OBU need only merge said template with the specific information concerning the relevant user when prompted to print or display.

Detail Description Paragraph:
[0279] There are also circumstances where vehicle insurance and registration documents need to be accessed. In the prior art, it is common for such documents to be left in the rental vehicle or manipulated at every single rental transaction. To avoid such an opportunity for theft or loss, it is provided that vehicle documents can be viewed on request either on the OBU's display (16) or on the side-window display (15) or on a local printer within rental vehicles if appropriately equipped. To enable such localized display or printing, the CRMLS remotely downloads a template or image of the documents into the OBU's memory and the documents can be electronically retrieved at will (26).

Detail Description Paragraph:
[0281] There are circumstances such as emergencies when instant voice or data communication is required or desirable between the user and the Customer Service and Response Center (CSRC) (25). For this reason and if desired by the system manager, it is provided that a communication link may be established instantly with the CRMLS by pressing a single button on the OBU keyboard or display (16) or by following the complaint process as will be seen further. Upon establishing such link, the OBU transmits along the last recorded GPS position so that the CSRC may instantly and precisely locate the vehicle without the user's participation.

Detail Description Paragraph:
[0283] As the radio-communication bandwidth, personnel requirements and telecommunications costs are much greater to hold live conversations between users and CSRC than to exchange standardized short text messages, a system manager may limit the use of direct voice communications to emergencies and deal with other requests via a short message system. Furthermore, there may also be circumstances where some users are not fluent in the language(s) spoken by the Customer Service and Response Center representatives (CSRC) within a national rental system. For those reasons, it is provided that users and CSRC may exchange pre-configured text messages and that said messages be automatically converted in the relevant language so that parties may communicate more easily.

Detail Description Paragraph:
[0286] For safety and convenience reasons, it is also provided that all communications exchanges between OBU and CRMLS/CSRC are accompanied with the geographic position such as the last GPS reading in order to improve the relevance and accuracy of the exchanged information (FIG. 14C).

Detail Description Paragraph:
[0291] 6.7.18 Renting Air Time on the Communication System

Detail Description Paragraph:
[0292] As can be seen from FIG. 14C, users may use the communication system within rental vehicles for their own personal use and be billed for it.

Detail Description Paragraph:
[0294] As can be seen from FIG. 8B and as mentioned in section 6.1.7, users are

prompted to provide their preferred electronic mail (email) address upon registration along with the relevant connection details. Thereafter and during the use of any equipped rental vehicle anywhere in the world, it is provided that a user may automatically retrieve emails from his own preferred email address by simply requesting such service through a one-step digital or voice command. This is made possible by the CRMLS and/or the OBU having stored the user's mail server address and access methodology upon registration.

Detail Description Paragraph:
[0295] As can also be seen in FIGS. 14C and 13C, the system enables vehicle rental service providers to bill users for such electronic messaging service.

Detail Description Paragraph:
[0297] A user may occasionally want to share the burden of driving a rental vehicle with one or more traveling companion(s) (in the case of a road vehicle for example). In order to allow said additional driver(s) to operate legally the rental vehicle and in cases when a full registration of the additional driver is not convenient, it is only required that minimal information be entered by said additional user/driver. Said information may comprise name and driving license number provision for past record verification or insurance purposes. To do that, the OBU enters into a dialogue with the additional driver to capture and retransmit the relevant data to the CRMLS, which in turn verifies and communicates back its authorization.

Detail Description Paragraph:
[0298] 6.7.21 Showing Accruing Mental Costs During the Rental Transaction

Detail Description Paragraph:
[0299] As can be seen in FIG. 15A, the OBU constantly monitors the distance, elapsed time, energy consumption and miscellaneous costs to constantly provide the user with real-time information on the rental transaction.

Detail Description Paragraph:
[0301] In order for transactions to proceed swiftly and since most users will usually request vehicle rentals within the same geographical area. It is provided that all BSS's within a given area will be loaded with basic information on the users most likely to request services within said area. Thus, in the case of a network failure, it is provided that dramatic system shut down can be avoided and that basic rental operations can be carried out between users and service providers.

Detail Description Paragraph:
[0303] It is important to ensure that users comply with their scheduled rental periods in order to optimize the use of the rental fleet and to provide for the early detection of stolen or abandoned vehicles. As can be seen from FIG. 15B the system provides for automated electronic or voice messages to be communicated on board a rental vehicle to inform users of the expiration or imminent expiration of the reserved rental period and to offer them the option of extending their rental period.

Detail Description Paragraph:
[0304] As can be seen from FIGS. 13D, 15B and 17A, the system can also be programmed to levy a penalty, update the behavior/volume rating and verify a user's credit card upon detection of an overdue rental vehicle.

Detail Description Paragraph:
[0305] Additionally and in the case of an overdue rental where the user is not communicating with the CSRC, the system locates the vehicle for the relevant authorities to intervene. As can be seen in FIG. 17A, it is provided that the OBU can immobilize the vehicle based on its own system manager's criteria and on a CSRC

or CRMLS command when said vehicle is idle.

Detail Description Paragraph:
[0307] As can be seen from FIG. 15B, the invention also provides for users to avoid any penalty, notification or immobilization of the vehicle by reporting delays and changing their rental period. Said changes can generate a fee.

Detail Description Paragraph:
[0310] Additionally, the system provides for system managers to program a perimeter within which vehicles are allowed to operate. The OBU warns users when they are exiting the authorized rental zone such as when crossing a border into a territory where the vehicle is not authorized (28). As can be seen in FIG. 15B, said action to bring a rental vehicle out-of-bound generates a monitoring from the CSRC as well as optional billing and user behavior/volume updating.

Detail Description Paragraph:
[0312] As can be seen in FIG. 15B, it is provided that the system can deliver system manager defined messages to users when entering an area of particular interest. As an example, the geographic locations corresponding to areas of high theft risk, parking restrictions, construction delays, special tourist attractions or transportation nodes can be entered in the OBU's memory and trigger said messages. As another example, a rental vehicle's OBU entering an airport perimeter could automatically display or read information to the user such as a terminal-referenced airline directory.

Detail Description Paragraph:
[0315] 6.7.28 Rental Vehicle on a Ferry Boat

Detail Description Paragraph:
[0316] In order to prevent the OBU from calculating and generating a charge for the distance traveled by a rental vehicle when it is carried by a ferry boat or other transportation means, it is provided for the OBU to monitor its position in relation to such transportation means. As can be seen in FIG. 15B, the OBU continuously compares its location with its database and stops adding to the traveled distance when it recognizes that the vehicle is travelling over a corridor which corresponds to a waterborne segment or, more generally, that does not correspond to a road.

Detail Description Paragraph:
[0317] The positions corresponding to said corridors could be entered by the system manager using methods that are well known to those who are familiar with the art of digital mapping.

Detail Description Paragraph:
[0318] 6.7.29 Vehicle Speeding and Suspected Accidents

Detail Description Paragraph:
[0319] Although there is a general privacy protection provided by the system to ensure that users' information is not used inappropriately, there may be circumstances and vehicle types (e.g. freight vehicles with special content) where it is justified for service providers to control the speed at which rental vehicles are operated. Furthermore, a brutal variation in speed can also be an indicator of an accident and there may be a need to associate such variations with the location where they occurred for future reference. There is also a greater consumption of energy at higher speeds and the vehicle rental service provider being responsible for the payment of said energy, there is an interest on its part to optimize the energy utilization.

Detail Description Paragraph:
[0320] As can be seen in FIG. 15A, the speed control function can be activated by

the system manager and be correlated to a digital map database to determine if a vehicle is exceeding the speed limit on a given segment. If and when speed excess or a brutal deceleration is detected, the position and speed corresponding to the event will be logged and communicated to the user register at the time of return.

Detail Description Paragraph:
[0323] As can be seen in FIGS. 15A and 18A, the OBU constantly monitors the energy level in the rental vehicle. In the case of a vehicle equipment where the energy level can be read from the vehicle instruments (e.g. through open specifications and protocols such as AMI-C, IDB, MOST, LIN), it is provided for the OBU to obtain the exact energy/fuel level at all times. In the case where a universal interface is not available and to avoid costly calibrations, it is provided for the OBU to reckon the energy level through a logical process which computes the energy consumption at various speed levels, the energy/fuel tank capacity) and the refueling gains. It should be noted that in the case where reckoning methods are used and if the last user has defrauded the system, there is a possibility for the OBU to operate with a false fuel level measure temporarily. As will be seen further, such errors become immediately apparent and are corrected when the following user enters the accurate fuel level. Indeed, where the reckoning method is used, it is provided for the user to enter the fuel level or confirm an OBU-suggested fuel level upon retrieving a vehicle in order to track down defrauding users and defend the system integrity. In the case where perfect accuracy is needed and if the fuel level is read from the vehicle instruments, then there is no such opportunity for error but calibration or universal interface connections with the specific vehicle are required. When comparing the 2 methods, it should be remembered that absolute accuracy in fuel levels measurement is not desirable at any cost. In fact, even with direct measurements of a fuel tank, there is still a significant variance between readings depending on the inclination of the vehicle for instance. In practice, it should only be required if a rental vehicle provider wishes to invoice for fuel separately as opposed to factoring its average cost into distance and time charges.

Detail Description Paragraph:
[0324] As can be seen from FIG. 18A, when the OBU detects that the energy level is below the system-manager defined criteria in a rental vehicle, it sends a message requesting that the energy reserve be refilled. If the incentive function is in place, the OBU will display the advantage (e.g. monetary) which will be granted to the user for performing the task of refueling the vehicle to other users' benefit. Upon confirmation that the user has supplied the vehicle with energy, the OBU then deducts the applicable rebate from the rental transaction in progress to materialize the offered incentive. Such method is required because users have little incentive to refuel vehicles when they are only using them for a short period. In fact, they will have a tendency to pass this responsibility onto the next user as long as there is energy left, often returning vehicles with a desperately low energy level.

Detail Description Paragraph:
[0326] As can be seen in FIGS. 15B and 18A, the OBU can detect when a rental vehicle is entering a geo-location corresponding to an energy/refueling station if it is programmed to do so. If the OBU recognizes that said station is an authorized service point, it can send a message to the user requesting that the vehicle be filled up completely and specifying the appropriate grade or type of energy. If said station is not authorized, the OBU will indicate to the user that it is not possible to re-supply at that service point. If desired, the OBU can also enter into a dialogue with the user to confirm the quantity of fuel and the completion of the refueling process.

Detail Description Paragraph:
[0328] In the prior art model, it is customary for users to retrieve vehicles when they are full of energy using one refueling/payment method or another. However,

such methods generate one refueling action per rental, which is often an inconvenient, costly and inefficient use of time for short-distance rental customers and rental vehicle providers. The invention can also function within the prior art model but in a preferred embodiment, it is provided for the system to bill users on the basis of any distance, time or fuel combination without the need to begin each rental with a full fuel reserve. The system can either factor the cost of energy into the distance and time rental costs or, alternatively, measure the exact amount of energy used and separately charge for it. Thus enabling several users to use a rental vehicle for short distances without having to refuel said vehicle every single time.

Detail Description Paragraph:
[0329] In order to do that without burdening users with reimbursement claims, it is provided for the rental vehicle provider to be directly responsible for the energy costs and to pass those onto users through the rental transaction. As for the actual payment, there are 2 methods favored to execute it depending on the available infrastructure and the development of open standards and technology. In one embodiment, each rental vehicle is equipped with a vehicle-specific transponder (31) that can directly communicate with the energy supplier using a radio-frequency identification communication RFID for instance. In such embodiment and within the refueling operation, the vehicle and the energy station exchange payment information, fuel grade and quantity data and authorization codes between themselves. Thus, users who have been requested to refuel vehicles do not have to manipulate any document or card and the bill is sent directly from the energy supplier to the rental vehicle provider (See FIG. 18B). In a second embodiment, every single user is given a card upon registration which can be used to charge energy payments directly onto the rental vehicle provider's account (4), in a much similar way then fuel-related corporate credit cards are used by employees on behalf of their employers. Upon re-supplying rental vehicles with energy, users are authorized to present said cards for energy-related payments on behalf of rental vehicle providers.

Detail Description Paragraph:
[0331] Since users want to carry as few cards or other access means with them as possible, there is an interest in having the access card and the fuel card merged into one. It is provided for the entire rental process to be enabled from one single user card (e.g. a contact-less smart card that can trigger the doors to unlock (4) and also serve as a payment instrument using the magnetic stripe or the card's electronic chip.

Detail Description Paragraph:
[0333] Transponders and fuel credit cards are in effect credit instruments at the disposal of users to pay for items on behalf of the rental vehicle provider. Consequently, there is a significant opportunity for fraud if their use is not controlled:

Detail Description Paragraph:
[0338] User siphoning fuel from a rental vehicle while engaged in a rental transaction.

Detail Description Paragraph:
[0340] For this reason, a series of methods are used to make it unattractive for users to defraud the rental vehicle provider. Said methods are as follows:

Detail Description Paragraph:
[0343] Linking open rental contracts with energy payments: See 6.7.35.

Detail Description Paragraph:
[0349] 6.7.35 Linking Open Rental Contracts with Energy Payments

Detail Description Paragraph:
[0351] Thus, it is provided for the CRMLS to be linked to the server of the Energy Supplier or its sub-contracted financial organization responsible for such authorizations. As can be seen in FIG. 18B and upon receiving such request, the Energy Supplier's server than interrogates the CRMLS to verify that the user is currently engaged in a rental transaction and can logically be authorized to use the payment instrument. Should the user corresponding to the credit card being verified not be engaged in a rental transaction at the time or should it have acquired unauthorized products, then the authorization would be automatically denied and the attempted fraud detected.

Detail Description Paragraph:
[0352] Delayed method: If such an instant link is not possible between the Energy Supplier and the CRMLS, the Energy Supplier will still transmit the various charges regularly (e.g. weekly) and those transmissions can be made using EDI (Electronic Data Interchange) supported methods (e.g. ANSI X12 standards). It is customary for each charge to be associated with a time, date and a coded location on such electronic statements. Using a logical comparison method, the CRMLS can then compare its register of transactions with the charge and single out any transaction that is not positively matched. Through a manual action, the rental vehicle provider can then investigate and take appropriate action in case of fraud or coding error.

Detail Description Paragraph:
[0354] As was seen previously, fuel theft can occur when a user siphons energy out of a rental vehicle or when the fuel acquired on behalf of the vehicle provider is not fully re-supplied into the rental vehicle. An example of this is provided by a user normally engaged in a rental transaction who would acquire fuel on the rental vehicle provider's account and physically put some of the fuel in a personal jerrican or in a friend's vehicle.

Detail Description Paragraph:
[0358] A returning vehicle's fuel level should logically correspond to the initial level when the journey began, minus the actual or estimated quantity of fuel consumed during the journey plus the refueled quantities (losses such as evaporation notwithstanding). As the fuel consumption during a rental transaction can be estimated fairly accurately and as users provide a confirmation of the fuel level reading when beginning a rental transaction (see 6.7.7), the OBU can easily compare the stated fuel levels against the expected fuel level and signal any significant discrepancy.

Detail Description Paragraph:
[0359] Although it is known that road surface, traffic conditions, vehicle payload, terrain, weather, use of accessories such as air conditioning and aggressive driving behavior do have a significant impact on consumption, the order of magnitude of such variance is still relatively limited. For instance, in the case of light-duty vehicles such as automobiles, there is credible evidence that the combined impact of aggressive driving behavior and air conditioning on fuel consumption does not exceed 30%.sup.1 even in the worst scenarios and is generally in the 10% range of variance.sup.2. Thus, the OBU could be programmed to report variances in excess of 50% to the CRMLS, providing plenty of room for varying conditions of use. Now it should be noted that although such tolerance margin may seem easy to abuse, it is in fact quite effective when related to the actual quantity of fuel that could be stolen without detection. First of all, one should bear in mind that in order to steal fuel without detection, a user needs to open a rental contract and pay for it (as opposed to a simple break-in crime against which there is no more protection than for any other vehicle in circulation). Secondly, fuel/energy theft is a relatively cumbersome and petty enterprise and a significant quantity must be stolen for fraudulent users to gain from it or for the vehicle provider to suffer material consequences. Using the example of a vehicle with a

fuel reserve of 17 US gallons or 65 liters and a consumption of 23 miles per gallon or 10-liters/100 km, the average autonomy of the vehicle would be 400 miles or 650 km. Should a user wish to steal a mere 4 gallons or 16 liters of fuel from a vehicle, he would need to pay for a rental vehicle over a distance of 200 miles or 325 km in standard conditions for the theft to go unreported.sup.3. Thus, such approximate method based .sup.1 See United States Environmental Protection Agency, Air and radiation, EPA420-D-99-002a, March 1999, pp. 20-22. .sup.2 See European Conference Of Ministers of Transport (ECMT) Workshop on In-Car technology, Delft, 1996 Dr. J. Vancke: Techniques for Influencing Driving--The Driver's view. pp.2-4. .sup.3 At 50% of the vehicle's autonomy, the standard consumption is 8.5 gallons or 32.5 liters. A 50% tolerance level would enable the fraudulent user to "show" a 12.75 gallons or 48.75 consumption at that point, providing an opportunity to steal approximately 4 gallons or 16 liters without being detected if the vehicle has been driven in standard conditions. on reckoning still provides for effective deterrent against most forms of systematic and significant fuel theft.

Detail Description Paragraph:
[0363] As can be seen in FIG. 18A, users should normally refuel vehicles when prompted to do so by the system (See section 6.7.30). There may be cases where users will volunteer to refuel vehicles without incentive, for example users that are particularly prudent and like to have a full fuel reserve before a long trip. However, frequent refueling may be a sign of fraud and the system detects abnormal re-supply patterns such as refueling vehicles much more often per traveled distance than the average user (ex: 50% of rentals result in a refueling operation for a given user Vs a 10% average). Although a rare occurrence, the opportunity for merchants to collude with users to exploit an automated system must also be controlled. Thus, the system can also signal suspicious same location refueling patterns as defined by the system manager to assist in fraud prevention activities.

Detail Description Paragraph:
[0365] Smart cards have the ability to be read from and written onto as a result of a dialogue through an electronic antenna and it is possible for the rental process to require users to present their smart cards both upon entry and exit to complete a rental transaction. As a substitution to the methods described in section 6.7.32, it is possible for an OBU to activate the fuel charge function on a smart card upon the beginning of the rental transaction. Similarly, the OBU can deactivate said smart card's fuel charge function when the user is signing off electronically at the end of a rental transaction, thus ensuring that users only charge fuel on the providers account when they are engaged in a rental transaction. Furthermore, it is also possible for smart cards to be uploaded with electronic money provided the necessary protocols and administrative agreement exist between the vehicle provider and the Energy supplier.

Detail Description Paragraph:
[0367] As was seen in sections from 6.7.34 to 6.7.38, fraud prevention methods signal suspicious events or discrepancies and said suspicions may be unfounded or merely the result of coincidence. However, the probability of fraud significantly increases when said suspicious events are repeated. Thus, it is provided for the system to register each event in the relevant user file and to trigger a warning when the number of events reaches a certain manager-defined level (e.g. 3 suspicious events within 25 rental transactions).

Detail Description Paragraph:
[0369] Users can forward a complaint, comment or suggestion to the rental vehicle provider at all times using the OBU (FIG. 14C) or the Internet. Such complaint mechanism can be used to report mechanical problems or untidy vehicles for instance. As can be understood from FIG. 17B, the complaint mechanism's main purposes are to:

Detail Description Paragraph:
[0376] As can be seen in FIG. 17B, it is provided for the system to automatically establish a voice communication between the user and a live operator in the CSRC in order to provide a near-instantaneous response to incidents that are coded as a high-priority such as accidents, major damages or unsafe vehicles.

Detail Description Paragraph:
[0380] In the case where a user encounters sub-standard conditions upon or during a rental transaction, it is important from a customer service standpoint to offer said user alternatives as quickly and reliably as possible. For instance, if a user has unfortunately rented a malfunctioning vehicle, it is important to provide said user with a replacement vehicle as soon and as near as possible. As was seen in section 6.7.15, the system is equipped with an automated vehicle location function or AVL. Thus, it is provided for the CRMLS to compare the position where a relevant complaint comes from with a digital map of locations and the Vehicle Inventory and Reservations Register in order to find the nearest available vehicle. Upon, completion of such process, the information is sent directly into the vehicle for the user to review and accept or reject. Upon acceptance, the CRMLS automatically sets a vehicle aside at the selected location and provides directions to the user through the OBU.

Detail Description Paragraph:
[0382] As soon as a complaint is filed, it is provided for the CRMLS to automatically generate a message or a service request to the field department of the rental vehicle operator or a third-party service organization. Such message includes the precise location of the vehicle and complaint code as well as other relevant information (FIG. 7A). The message is either sent to the nearest geographical service center (e.g. an affiliated repair center) or, as will be seen further, it can be sent to the nearest service vehicle in the area using AVL equipped service vehicles. The service personnel can then inspect the affected vehicle, prepare a field report and take the necessary actions to resolve the issue. To ensure that said field reports are efficiently handled at later stages, it is provided for the field technicians to electronically record pictures, comments and codify the incident (FIG. 7B).

Detail Description Paragraph:
[0385] As can be seen in FIGS. 7A, 7B and 14C, the codification of complaints and field reports enables complex information to be processed automatically to the relevant department within a rental vehicle provider's organization and for human interventions to be targeted where they are most valuable. For instance, it is provided for the system to sort incidents between various categories such as:

Detail Description Paragraph:
[0387] Complex issues that require human judgement such as a road accident

Detail Description Paragraph:
[0392] As there is no inspection of returned vehicles, unmanned rental systems can be subject to increased user negligence. However and as was seen in section 6.7.6, it is provided for users to take a limited responsibility and confirm the prior inspection of a rental vehicle upon initiating a transaction. Thus, users become de facto vehicle inspectors. Because such process is subject to mistakes or malicious complaints and as there can be no certain proof that a complaint should be linked to a specific user, it is provided for the system to only allocate a probable responsibility and to inform users of such incidents. Thus and as can be seen in FIGS. 7A, 7B and 17B when an incident is reported and the field technician confirms the strong presumption against a particular user (e.g. the previous user) or group of users (e.g. all users that have rented the vehicle since the last field technician inspection), a message is sent to the relevant user(s). The complaint is then associated to each relevant user in the User Register only to monitor the frequency of occurrence and show the trend for a given user. Such messaging serves

as a deterrent insofar as it communicates the fact that although apparently unmanned, the automated rental system is still subject to regular human supervision by peer-users and staff.

Detail Description Paragraph:
[0394] However, if the incident is coded as minor, it is provided for the system to automatically generate warning messages and to log the incident into the relevant user files. Additionally, users are informed of the fact that a complaint has been logged into their file and are provided with an opportunity to file an opposition to the complaint. In this manner, it is not possible to strictly enforce good user behavior on every single rental but when the complaints against a specific user are repeated, the probability becomes sufficiently high to justify a special investigation on the part of the vehicle provider. If desired, the behavior/volume rating can also be modified, a message sent and a charge levied as a result. It should be noted that in the case of user opposition to a complaint, there is no human reading of such response until the specific user is subject to an investigation but an automated acknowledgement is sent electronically.

Detail Description Paragraph:
[0396] As can be seen in FIG. 17B and in the case of a reported incident, it is provided for the system to automatically maintain the reserve on the credit cards of all relevant users (e.g. past 5 users or users in the past 24 hours, see section 6.7.10). This is done as soon as the incident code is received by the CRMLS to minimize the risk of collection problems and provide the vehicle provider enough time to proceed to a field investigation. Upon a condemning inspection, the system automatically debits a responsible user's credit card to collect the insurance deductible franchise if this is allowed by the general rental agreement (section 6.1.7).

Detail Description Paragraph:
[0398] As the treatment of vehicle damages represents a substantial activity for vehicle rental providers, there is a substantial benefit to be gained in managing insurance claims more efficiently. Moreover, a damaged vehicle does not generate revenues until it is returned to the active fleet and any reduction in vehicle downtime produces substantial gains. Thus, once the fundamental facts surrounding an incident have been acquired from the field technician and the relevant user and coded with sufficient details, it is provided for the system to automatically inform the insurer of the precise incident circumstances and of the location of the vehicle for inspection.

Detail Description Paragraph:
[0400] As was explained previously, it is crucial for a damaged vehicle to return to the fleet as quickly as possible. In a preferred embodiment and as can be seen in FIG. 7B, the field technician (or contracted third-party) is empowered to take the necessary actions with a sub-standard or damaged vehicle and then transmits a coded account of such actions to the CRMLS. For instance, in the case where the vehicle has been sent to Repair Shop ABC using Towing Co. XYZ, the CRMLS will create a manifest of such actions for the subsequent incident management and accounting of vendor invoices.

Detail Description Paragraph:
[0405] There is evidence that an OBU's visual, tactile or voice interface can distract a rental vehicle operator and create a safety hazard. Thus, it is provided for the OBU system to monitor the vehicle speed throughout most processes and for its display to be automatically shut down or for the voice commands to be limited to simple operations when the vehicle is in motion (FIG. 14C).

Detail Description Paragraph:
[0407] As indicated in section 6.2.2, the distance traveled by a vehicle can be directly measured from the vehicle instruments, especially when the data bus

carrying such information is accessible by universal means and provides a standardized signal that can be read without the need for costly calibration. However, in the present state of car manufacturing technology, such common standards are not the norm and there are no signs that this standardization will occur in a near future with other vehicles such as boats, trucks or airplanes. Thus, another method is used to obtain the distance measurement quickly and with a reasonable accuracy when cabling. As can be seen in FIG. 15A, the OBU constantly receives a data stream from the GPS antenna and receiver. By frequently sampling such GPS coordinates (e.g. 3 times per second) and processing it further, the OBU is able to determine with good accuracy the distance traveled by the vehicle. To further guarantee the integrity of the positioning data, it is also provided for the OBU to frequently reference (dead reckon) sampled GPS coordinates against another measuring system such as a digital road map featuring actual distances.

Detail Description Paragraph:
[0409] As can be seen in FIG. 15A, it is provided for the system to constantly compare its position to the rental locations' geographical coordinates in its memory.

Detail Description Paragraph:
[0410] As can be seen in FIG. 15A and as soon as the OBU detects that the vehicle is idle within a rental location perimeter, it prompts the user to confirm whether or not the vehicle is being returned (as opposed to being temporarily parked at the location for later use). Upon confirmation, the OBU transmits the rental transaction data to the CRMLS for further treatment and billing.

Detail Description Paragraph:
[0412] As users can forget to confirm the end of a rental transaction or to lock the doors of a rental vehicle, it is provided for the OBU to initiate a time countdown when it detects that the vehicle has entered a rental location (FIG. 14B). On failure to respond after the countdown has elapsed, the OBU automatically orders the doors locked.

Detail Description Paragraph:
[0414] As was seen before, planning and optimizing the distribution of vehicles within a rental system is a complex and dynamic process, especially when spontaneous one-way rentals are allowed. In section 6.6.3, several methods to modify the demand curve for rental vehicles were proposed to prevent or reduce vehicle imbalances between locations. The concept behind such demand-side measures is to redistribute users to match a given vehicle distribution without incurring the cost of physically relocating vehicles. However, demand-side measures only provide part of the solution and it is normally required to physically redistribute vehicles to match the user distribution and through the use of offer-side measures.

Detail Description Paragraph:
[0415] Traditionally, vehicle operators either pay employees to move vehicles between stations or simply refuse reservations or spontaneous rentals when a location is sold out, even if other locations have a surplus.

Detail Description Paragraph:
[0416] However, such methods greatly impact fleet costs, user satisfaction and parking space management. Moreover, in the case where several hundred vehicles are rented on an hourly basis and allowed for one-way trips between dozens of locations in a city, the cost of not optimizing the fleet or of balancing it through employees becomes prohibitive and parking issues can become unmanageable.

Detail Description Paragraph:
[0421] b) Restrict one-way rentals out of the affected locations (6.8.1)

Detail Description Paragraph:
[0424] It should be noted that the order of the above-listed measures can be changed and that the measurement of the total demand curve refers to all the demand components as can be seen in FIG. 16C. This would include for instance the anticipated spontaneous rentals at the out-of-balance location based on historical trends. Thus, an anticipated shortage of vehicles is not necessarily certain to materialize and the system takes into account the severity of the shortage in the adoption of the following countermeasures.

Detail Description Paragraph:
[0425] 6.8.1 Restrict One-way Rentals out of the Affected Locations

Detail Description Paragraph:
[0426] As can be seen in FIG. 16B, when the CRMLS detects that the risk for a forecasted imbalance to materialize is greater than a system-manager defined threshold (e.g. risk factor 1), it then ceases to accept spontaneous or reserved one-way rentals out of the affected location.

Detail Description Paragraph:
[0428] As can be seen in FIG. 16B, when the CRMLS detects that a particular station is facing possible shortages (e.g. risk factor 2), it automatically sends an incentive offer to selected vehicles travelling within or in the direction of the location group (30). The selection of vehicles is made on the basis of various logical criteria and group broadcasts, for instance the offer is initially sent to vehicles for which the programmed drop-off location is within a certain radius of the rental station affected by the shortage. Such gradual and narrowly targeted transmission method is intended at reducing telecommunications costs and unnecessary disturbance of users engaged in a rental transaction. Relocation incentives are also published on the Internet site of the provider for other "shopping users" to see even when they are not engaged in a rental transaction.

Detail Description Paragraph:
[0431] It should be noted that the above-described user-incentive approach is particularly applicable where rental stations are connected between each other by alternative transportation means, e.g. public transit. The underlying theory being that the lesser the inconvenience to users, the more inclined they will be to trade the time lost in the fleet relocation process for incentive payments.

Detail Description Paragraph:
[0432] It should also be noted that relocation offers are reissued when a vehicle is rented again. In fact, the OBU always verifies if relocation incentives are available as part of the normal CRMLS query when initiating a new rental transaction.

Detail Description Paragraph:
[0438] There is a well-known vehicle inventory category within the vehicle rental industry that is often referred to as "foreign vehicles". This category represents vehicles that have entered the vehicle fleet of Service Provider A but in fact belong to Service Provider B. The main reason for such "foreign vehicles" to enter the fleet of another operator is related to one-way rental movements. Quite typically said one-way movements occur on inter-city traffic between different service providers trading under the same national franchise banner. It is also customary for said foreign vehicles to be rented in turn by the host operator (e.g. Service provider A) and for a compensation to be paid to the legal vehicle owner (e.g. Service Provider B). This compensation is often referred to as split revenue.

Detail Description Paragraph:
[0439] Some real limitations arise from the above-described practices and are well exemplified by the high price that is currently charged for one-way car rentals in

most parts of the world. For example:

Detail Description Paragraph:
[0441] One-way rentals between unaffiliated entities require piecemeal negotiations between parties and are uncommon, thus preventing small or medium-size operators from easily forming a national network with their peers.

Detail Description Paragraph:
[0444] Different vehicle providers have different maintenance procedures and it is difficult to keep track of damages, maintenance and transactions conducted by others on behalf of the owner in a fair, accurate and defensible manner.

Detail Description Paragraph:
[0449] Automatically promote one-way rentals between locations (6.8.9).

Detail Description Paragraph:
[0450] Promote one-way rentals to locations where vehicles are sold (6.8.10)

Detail Description Paragraph:
[0455] As can be seen in FIG. 13E, it is provided for the CRMLS to verify the ownership of a vehicle upon closing a rental transaction. As can be seen in FIG. 19A, once the CRMLS has detected that a charge has been generated by a foreign vehicle, it automatically interchanges relevant electronic invoices and payments with the owner (EDI).

Detail Description Paragraph:
[0457] As can be seen in FIG. 19A and in circumstances where a third party is operating the CRMLS, it is provided for the system to act as a neutral observer, an access gateway and a clearinghouse between vehicle rental providers. Thus, vehicles' OBUs and CRMLS automatically report the relevant information such as traveled distance, damages, complaints, maintenance entries, generated charges and other relevant information both to the acting operator and owner of the vehicle. Vehicle owners can then keep track of their fleet in real time, depend on a reliable audit trail without unnecessary labor or effort even when part of their fleet is mixed and dispersed in foreign locations.

Detail Description Paragraph:
[0459] As can be seen in FIG. 19A, the system can direct a user towards a specific vehicle when it has detected an opportunity to return a foreign vehicle to its origin or to a location group that is close to its origin. It should be noted that this specific allocation of a rental vehicle goes against the allocation method of section 6.6.1 and is only applicable to one-way rentals with foreign vehicles.

Detail Description Paragraph:
[0460] 6.8.9 Automatically Promoting One-way Rentals between Locations

Detail Description Paragraph:
[0461] It is known from the current vehicle rental industry that a significant category of users react to special promotions. Said users are often willing to modify their time of travel and destination in order to save money.

Detail Description Paragraph:
[0462] In order to take advantage of such factor it is provided for the CRMLS to automatically publish a list of vehicles that the provider is interested in moving from one location to another. These vehicles can either be foreign vehicles that need to be returned (FIG. 19A) or inventory surpluses that the provider wishes to transfer to another location group. Whenever the CRMLS recognizes a foreign vehicle or a to-be-transferred vehicle in a fleet, it automatically posts a customized promotion for a one-way rental with the specific vehicle and to a specific location or location group. Such promotions are priced automatically by the CRMLS in

accordance with the system manager criteria.

Detail Description Paragraph:
[0463] 6.8.10 One-way Rentals to Locations where Vehicles are Sold

Detail Description Paragraph:
[0464] A large proportion of rental vehicles end their duty cycle in specialized vehicle auctions or retail locations designed to sell a high volume of vehicles rapidly. Since such final movements to the auction or to the retail location often require a freight carrier to haul the vehicles at great cost, it is provided for the system to promote a final one-way rental when disposing of a vehicle.

Detail Description Paragraph:
[0465] Thus, the system manager is able to code the auction or retail location as a station within a location group and as can be seen in FIG. 19A, the system can automatically trigger the promotion of a one-way rental to the nearest auction or retail location when a vehicle has reached the end of its duty cycle.

Detail Description Paragraph:
[0467] Since inventories of available-for-rent vehicles are comparable to time-sensitive goods, there is an interest in correcting a fleet unbalance as quickly as possible and it may be preferable to relocate a vehicle at a financial loss rather than maintaining it in a location that has a surplus. Unlike common auctions where the price is pushed up from below, the auction method known as the "Dutch auction" starts with a high price set by the auctioneer, in this case the rental vehicle provider. The price then drops until a buyer accepts to rent the vehicle from the advertised location to the location where it is most needed. Thus, it is provided for the system to actively promote the rental of foreign or to-be-transferred vehicles by regularly reducing the fare until it finds a user willing to bring it where it is most needed. As can be seen in FIG. 19A, said fare reduction is executed by the CRMLS within system-manager defined monetary increments and time cycles until a minimum threshold is met. The fare reduction is automatically advertised on the Internet and/or sent electronically to users who have subscribed to this service.

Detail Description Paragraph:
[0468] An example where such automated auctioning may be used is found in inter-city travel where a one-way automobile rental could be competing with airline service. By instantly and automatically advertising one-way rentals (FIG. 19A) and by reducing the price at regular intervals, the rental vehicle provider improves his chances of quickly finding a user willing to rent a vehicle for a one-way trip to the desired destination.

Detail Description Paragraph:
[0470] There are circumstances where vehicle owners require their vehicles back from a foreign location. By logging into the CRMLS from their location and via the Internet (not shown), owners or host operators are able to activate the vehicle recall or expulsion function. According to the invention, each time a foreign vehicle is returned from a rental transaction the CRMLS verifies if the owner has recalled the vehicle or if the host operator has requested for the foreign vehicle to be expulsed from its fleet. In both cases and as can be seen in FIG. 19A, the system then triggers the Dutch auction to expedite its return if the function has been activated and in accordance with system manager criteria.

Detail Description Paragraph:
[0472] 6.9.1 Informing Users of Parking Conditions at Destination

Detail Description Paragraph:
[0473] In road applications, the availability of parking space is a critical element in inner-city vehicle usage, especially for users initiating a one-way

rental.

Detail Description Paragraph:
[0474] As the CRMLS constantly projects the vehicle inventory through time at all stations (See FIG. 16A), it is able to determine if a parking space will be available at destination at a given time. Thus and upon initiating a rental transaction in relevant areas, the OBU can be programmed to ask the user (27A) if a parking space will be needed at another rental station or at destination. As can be seen in FIG. 19B, the user can also trigger such parking reservation process.

Detail Description Paragraph:
[0479] As can be seen in same FIGS. 19B and 13C, the process provides for the OBU to calculate a fee for parking reservations and actual parking usage time. Thus, it is possible for users to rent a vehicle, reserve a parking space before getting to a station and pay for said space without handling any coins or apparatus.

Detail Description Paragraph:
[0483] Buying and selling vehicles at the right time and with the right usage is a critical success factor within the entire vehicle rental process. In fact, vehicles are often acquired or leased on some form or another of program and must be sold or returned within specific mileage and time parameters. As can be seen in FIG. 19D and in order to optimize the administration of such activities, it is provided for the CRMLS to check each vehicle against the system manager parameters at specific intervals (e.g. on return from a rental transaction). The CRMLS then checks whether a vehicle should be sold or not. In the affirmative, a message is automatically sent for the relevant parties to activate the sale of the vehicle and the one-way rental promotion to the retail location can be initiated as was seen in section 6.8.10.

Detail Description Paragraph:
[0487] As can be seen in same FIG. 19D, the CRMLS automatically notifies the maintenance crew when a vehicle has reached a certain threshold of time or mileage to optimize and facilitate reliable maintenance. Along with the service request, the position of the vehicle is sent and the relevant vehicle becomes unavailable to users. In a preferred embodiment, the availability status is communicated to users through the side-window display (15) and reversed after the maintenance is completed.

Detail Description Paragraph:
[0489] A substantial portion of rental vehicle providers' profits is typically made or lost on selling vehicles. At times, said providers will sell vehicles at reduced prices and in large auctions volumes while at other times they will seek to get the most value out of a vehicle by selling it at retail conditions. In the current art, the process is almost entirely conducted in a manual fashion and it is quite a task for rental vehicle providers to dispose of vehicles by themselves. According to the invention and as can be seen in FIGS. 19C and 19D, the system enables rental vehicle providers to offer their vehicles for retail sale prior to sending vehicles to the auction and in order to maximize the selling price. In a preferred embodiment, such offers are communicated to users mostly through the Internet or other similar diffusion mode including the OBUs. Users also have access to the full vehicle maintenance history as it is automatically made available by the CRMLS to prospective buyers.

Detail Description Paragraph:
[0497] Upon agreeing to the rules of the general rental agreement, users typically accept responsibility for fines that result from parking or other traffic-related charges. However, in practice, it is often cost ineffective or difficult to properly enforce said rules and administer the related claims. According to the invention, it is provided for said administration to be greatly simplified and expedited through automation. As can be seen in FIG. 19C, it is only required for

an operator to enter the date, time and vehicle license plate related to an infraction ticket and the user's credit card is then automatically debited and the registers updated.

Detail Description Paragraph:
[0499] It is frequent for vehicle rentals to be booked through travel agents or other similar intermediaries. As can be seen in FIG. 13E, the system automatically recognizes a commission to the relevant agents when applicable. Furthermore, it automatically prepares the credit memo for the payment of said commissions to enable batch processing of a large volume of small transactions.

Detail Description Paragraph:
[0501] One of the benefits of the invention is to allow rental vehicles to be easily deployed on any property that is within cellular radio coverage. The value of such land can be recognized through commission payments to the landholder in a similar manner to section 7.2.2. As can be seen in same FIG. 13E, the CRMLS always verifies if a commission should be paid to a landholder upon completing the billing process. In the affirmative, it automatically issues a commission credit memo to the landholder for batch processing.

Detail Description Paragraph:
[0503] One of the largest rental vehicle markets is often referred to as the insurance replacement market. This market is essentially composed of policy holders who have sustained damages to their own vehicles, rental vehicle providers and insurers who accept to pay for replacement vehicles during a given period of time and within certain guidelines. Considering the high transactional cost of processing insurance claims and the benefit for insurers to direct the policy holder towards an approved rental vehicle supplier, there is a benefit in making the entire process as easy as possible from the initial authorization to the payment of the replacement costs.

Detail Description Paragraph:
[0504] Since policyholders (system users) can rent vehicles only when they need them and from small and widely dispersed locations, the present invention provides insurers with additional cost saving opportunities and better suited vehicle replacement options for their policyholders. Thus and as can be seen in FIG. 8B, it is provided for the CRMLS to establish an automated link with insurers' databases before turning a policy holder into a system user. Depending on its preference, an insurer can then issue an authorization number for the CRMLS to verify against the insurer's parameters if a policy holder has indeed the permission to rent a vehicle on said insurer's account. Alternatively, insurers may simply grant access to their database for the CRMLS to check the policy number against a certain policy holder profile. As can be seen in FIG. 13E, the CRMLS can automatically bill insurers for pre-approved rentals upon completion of a transaction or a series of transactions and send the resulting invoices through EDI.

Detail Description Paragraph:
[0509] In some applications, it is believed that the present invention may be used advantageously in carsharing, shared-leasing or shared-ownership applications. As an example of said shared-usage applications, one can imagine a situation where a given user has the responsibility of a vehicle in his/her morning and evening commute and during weekends while other users, work colleagues for instance, may use the vehicle during the day. Another example may be provided by a group of 5 users living in the same building and sharing the same specific vehicle for a prolonged period of time.

Detail Description Paragraph:
[0512] It is common for rental vehicle providers to offer ancillary services and equipment such as infant seats, ski and bicycle racks, furniture dollies, boxes and so on. Normally, such special equipment is not stored in vehicles permanently and

needs to be handled on a case by case basis.

Detail Description Paragraph:
[0513] In the case of an unmanned system open 24 hours a day, there is a need to find alternative methods to reduce costs and maintain the service. According to the present invention, it is provided that some rental locations will be supplied with locked compartments on the rental premises and for said compartments to be accessible automatically. Using the same access means required to enter a vehicle (6.1.2), users are then able to obtain the required equipment directly from the premises and without human intervention (FIG. 18D). In an alternative method, users may request special equipment from the vehicle's OBU and the OBU then contacts the ACU through the CRMLS.

Detail Description Paragraph:
[0515] Since users who retrieve special equipment such as infant seats may forget to bring them back, it is provided for the system to remind users of the presence of special equipment when they return a vehicle. As can be seen in FIG. 18D, once a user has retrieved an equipment from an ACU, said ACU (39) communicates with the CRMLS to associate the equipment rental to the vehicle rental as well as to trigger other monitoring and billing functions. The CRMLS in turn communicates with the rented vehicle to notify its OBU that there is an open ACU record on file. Once the user completes the related vehicle rental transaction, the OBU automatically reminds said user to bring back the equipment to the automated compartment (27).

Detail Description Paragraph:
[0526] In order to prevent the OBU from becoming out of true, it is provided for the maintenance crew to enter a master code on the OBU and to confirm the odometer and fuel gauge reading in rental vehicles upon regular maintenance or washing of vehicles. In this manner, the CRMLS and the system manager can have recorded confirmations of the vehicles' reading and have a defensible reference in case of dispute or erroneous billing for instance.

Detail Description Paragraph:
[0533] Although the system is designed for complex vehicle rental applications, some of its functions can also be used in much simpler fleet management applications.

CLAIMS:

1. An automated vehicle rental system for a fleet of rental vehicles, said vehicles being geographically distributed, each of said vehicles being normally locked when not rented, at least one of said vehicles, when not in use, being parked in an unguarded location; said system comprising: vehicle communications means for enabling communication to and from the vehicle, user-carried electronic devices, or other readers, and for interfacing with said user; an on-board unit (OBU) located on each of said vehicles for interfacing with said vehicle communications means, and with a door unlocking mechanism; a central reservations, management and location system (CRMLS) in communication through a communications network with each of said OBU, said CRMLS performing all reservations and management functions, said CRMLS being linked to a database containing a location and availability of each of said vehicles and a rate for rental, said CRMLS also being provided with an allocation manager system for geographically allocating vehicles; and a key for accessing said vehicle, said key being borne by said user.

5. A system according to claim 1, wherein said vehicle communications and positioning means include an in-vehicle data and voice communication system; an RF modem; an infrared device; a keyboard and display; a smart card reader; a transponder; a dedicated short range communication device; an antenna and GPS receiver; or a combination thereof.

7. A system according to claim 1, wherein said CRMLS is operatively linked with a credit verification service provider; with authorities responsible for issuing and controlling entitlement means; with providers of insurance records; with providers of content to mobile customers; with referring organizations; with a global distribution system; or a combination thereof.

10. A system according to claim 1, wherein said CRMLS communicates with said OBU through a local base station system which is installed within radio frequency range of a rental location,

12. A system according to claim 11, wherein said information related to said user includes a behaviour/volume profile, and wherein a rate for rental charged to said user is based on said behaviour/volume profile.

13. A system according to claim 12, wherein said behaviour/volume profile is based upon punctuality; vehicles returned in damaged or untidy conditions; vehicles returned in a location other than that originally booked; unreported traffic violations; failure to crystallize a reservation or to cancel an active reservation; using the vehicle outside an authorized area; or a combination thereof.

16. A system according to claim 1, wherein each of said vehicles further include a display that is visible from the outside of the vehicle, said display being operatively connected to said vehicle communications and positioning system, said display displaying information related to rental conditions, available services, maximum rental period allowed, one-way trip availability, equipment on board, or a combination thereof.

20. A system according to claim 1, wherein at least one of said OBU is connected to at an internal bus of a vehicle of said fleet of vehicles in order to mine information related to an odometer and a fuel gauge.

22. A system according to claim 1, wherein said reservation information includes a geographic perimeter within which a vehicle is usable, and wherein said OBU monitors a position of said vehicle while in use, and takes corrective action if said vehicle is used outside said geographic perimeter.

23. A system according to claim 1, wherein said OBU monitors a speed of said vehicle, and wherein said OBU takes corrective action is said speed of said vehicle exceeds a speed limit, or decreases brutally, signifying an accident.

25. A system according to claim 1, wherein said CRMLS is adapted to project based on vehicle inventory whether a parking space will be available at the end of a rental; and wherein said OBU is adapted to prompt a user for the desirability of a parking space at destination.

26. A system according to claim 25, wherein said system further includes a module for making a parking reservation at destination.

27. A system according to claim 1, wherein at least one of said vehicles is further provided with at least one locked in-vehicle storage compartment, said compartment being operatively connected to said at least one vehicle's OBU, so that when an authorized user of said at least one locked in-vehicle storage compartment takes possession of said at least one vehicle, said at least one storage compartment is unlocked.

28. A system according to claim 1, wherein said system includes at least one rental location, and wherein an automated compartment unit is located at said at least one location, said automated compartment unit storing ancillary equipment for use by a user.

29. A system according to claim 1, wherein a rate of rental is based on an insurance profile of said user.

31. A system according to claim 1, wherein at least one foreign vehicle belonging to another operator is introduced into said system, and wherein said system is adapted to administer and distribute split revenues; facilitate the flow of foreign vehicles; allocate foreign vehicles for return to origin; promote one-way rentals between locations; promote one-way rentals to locations where vehicles are sold; enable Dutch auction; enable automated foreign vehicle recall or expulsion; or a combination thereof.

35. A system according to claim 34, wherein said vehicle activity log includes maintenance information; incident information; location information, including an identification of the user, the user's behaviour/volume profile, duration and frequency of rental; or a combination thereof.

38. A system according to claim 1, wherein said vehicle communications means further includes vehicle positioning means, for obtaining or deducing a position of said vehicle.

Previous Doc Next Doc Go to Doc#

First Hit Fwd Refs Previous Doc Next Doc Go to Doc#
End of Result Set

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L11: Entry 1 of 1 File: USPT Feb 1, 2005

US-PAT-NO: 6850209
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TITLE: Apparatuses, methods, and computer programs for displaying information on vehicles

DATE-ISSUED: February 1, 2005

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DATE FILED: December 29, 2000

PARENT-CASE:
RELATED APPLICATIONS This application is related to the following application listed in this section. It is a continuation-in-part of and claims priority under 35 U.S.C. .sctn.119(e) from the following co-pending U.S. patent applications: Non-Provisional application 09/618,862 filed by Semyon Dukach et al. on Jul. 18, 2000, entiltled "Apparatuses, Methods, And Computer Programs For Displaying Information On Mobile Signs; Provisional Application 60/226,000 filed by Semyon Dukach et al. on Aug. 16, 2000, entitled "Apparatuses, Methods, and Computer Program For Displaying Information On Signs"; provisional application 60/237,238 filed by Leonid Fridman et al on Oct. 2, 2000, entitled "Apparatuses, Methods, and Computer Program For Displaying Information On Signs"; provisional application 60/238,232 filed by Leonid Fridman et al on Oct. 2, 2000, entitled "Apparatuses, Methods, and Computer Program For Displaying Information On Signs"; and PCT patent application filed with the USPTO by Semyon Dukach on Dec. 15, 2000, entitled "Apparatuses, Methods, and Computer Program For Displaying Information On Signs", which PCT application designated the United States of America

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PRIOR-ART-DISCLOSED:

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ART-UNIT: 2674

PRIMARY-EXAMINER: Tran; Henry N.

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ABSTRACT:

A system for publicly displaying messages includes elements carried by an automotive vehicle. In some embodiments the vehicle carries a publicly visible electronic display; a sensor for sensing the brightness of light in the vicinity of the display; and illumination varying circuitry for varying the brightness of light generated by the display in response to brightness detected by the sensor. In some embodiments the vehicles carries a publicly visible display formed by ganging together a plurality of displays, each having at least 640.times.480 pixels; and video drive circuitry for causing images to be shown on the ganged display with different portions of individual images being shown on each of the individual displays. In some embodiments the vehicle has an automotive electrical system and carries a publicly visible high-bright display, capable of providing over 1000 NITS illumination and having 640 by 480 or greater pixel resolution; and video drive circuitry causing images to be shown on the display. In some embodiments the

vehicle carries a publicly visible electronic display and a computer. The computer has video drive circuitry for causing images to be shown on the display, a memory device capable of storing representations of animated display images represented in vector-based form; and programming for enabling the computer to generate animated images from the vector-based animation representations. In some embodiments the vehicle receives commands and/or information controlling what it is to display via a wireless transceiver.

7 Claims, 85 Drawing figures

Previous Doc Next Doc Go to Doc#

First Hit Fwd Refs Previous Doc Next Doc Go to Doc#

End of Result Set

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L11: Entry 1 of 1 File: USPT Feb 1, 2005

DOCUMENT-IDENTIFIER: US 6850209 B2
TITLE: Apparatuses, methods, and computer programs for displaying information on vehicles

Detailed Description Text (62):
The mobile unit shown in FIG. 20 further includes a local communication device 382 that is capable of communicating directly with local communication devices of the same type that are relatively close to the mobile unit. The local communication device 382 can be any type of communication device capable of performing such communication. This includes infrared communication devices, and various radio-frequency wireless communication devices, such as communication devices complying with the Bluetooth communications standard.

Detailed Description Text (156):
Step 696 provides an interface to users enabling them to either upload the message desired to be displayed, or to select to compose and/or edit a personal message. If the user selects to compose and/or edit a personal message, then an interface will be provided which enables the person to produce a greeting in a manner somewhat similar to that provided by current Internet greeting card sites such as that operated by BlueMountain.com. In many embodiments the interface will either include software to decrease the likelihood of messages that contain obscenities or which would otherwise be offensive, or provides mechanisms for one or more humans to review such messages before they are shown, so as to ensure that they are not offensive.

Previous Doc Next Doc Go to Doc#

L19: Entry 1 of 1 File: USPT Feb 1, 2005

DOCUMENT-IDENTIFIER: US 6850209 B2
TITLE: Apparatuses, methods, and computer programs for displaying information on vehicles

Abstract Text (1):
A system for publicly displaying messages includes elements carried by an automotive vehicle. In some embodiments the vehicle carries a publicly visible electronic display; a sensor for sensing the brightness of light in the vicinity of the display; and illumination varying circuitry for varying the brightness of light generated by the display in response to brightness detected by the sensor. In some embodiments the vehicles carries a publicly visible display formed by ganging together a plurality of displays, each having at least 640.times.480 pixels; and video drive circuitry for causing images to be shown on the ganged display with different portions of individual images being shown on each of the individual displays. In some embodiments the vehicle has an automotive electrical system and carries a publicly visible high-bright display, capable of providing over 1000 NITS illumination and having 640 by 480 or greater pixel resolution; and video drive circuitry causing images to be shown on the display. In some embodiments the vehicle carries a publicly visible electronic display and a computer. The computer has video drive circuitry for causing images to be shown on the display, a memory device capable of storing representations of animated display images represented in vector-based form; and programming for enabling the computer to generate animated images from the vector-based animation representations. In some embodiments the vehicle receives commands and/or information controlling what it is to display via a wireless transceiver.

Application Filing Date (1):
20001229

Parent Case Text (2):
This application is related to the following application listed in this section. It is a continuation-in-part of and claims priority under 35 U.S.C. .sctn.119(e) from the following co-pending U.S. patent applications: Non-Provisional application 09/618,862 filled by Semyon Dukach et al. on Jul. 18, 2000, entiltled "Apparatuses, Methods, And Computer Programs For Displaying Information On Mobile Signs; Provisional Application 60/226,000 filed by Semyon Dukach et al. on Aug. 16, 2000, entitled "Apparatuses, Methods, and Computer Program For Displaying Information On Signs"; provisional application 60/237,238 filed by Leonid Fridman et al on Oct. 2, 2000, entitled "Apparatuses, Methods, and Computer Program For Displaying Information On Signs"; provisional application 60/238,232 filed by Leonid Fridman et al on Oct. 2, 2000, entitled "Apparatuses, Methods, and Computer Program For Displaying Information On Signs"; and PCT patent application filed with the USPTO by Semyon Dukach on Dec. 15, 2000, entitled "Apparatuses, Methods, and Computer Program For Displaying Information On Signs", which PCT application designated the United States of America

Brief Summary Text (11):
In some embodiments the vehicle carries at least two of the publicly visible

displays, and each display has an associated light sensor and illumination varying circuitry for varying the generated brightness of each display in response to the brightness detected by its associated light sensor. In some such multiple-display embodiments each displays is lit both by light incident upon display and by light generated by display under control of the illumination varying circuitry. Examples of such displays include transreflective displays, which can pass either generated or reflected light through a display's light valve to brighten its image, as well as displays that generate an images by spatially varying reflective shade or color, which can be light by either ambient or generated light. The illumination generated for each display can be controlled as a function of the amount of light falling on its associated light sensor, either dependently or independently of the amount of light generated for other displays and/or the amount of light falling on other the sensors associated with the position of other displays.

Brief Summary Text (12):
According to another aspect of the invention a system for publicly displaying messages comprises an automotive vehicle carrying the following elements: a publicly visible display formed by ganging together a plurality of individual electronic displays, each having at least a resolution of 640.times.480 pixels; and video drive circuitry for generating signals to cause images to be shown on the ganged display, with different portions of individual images being shown on each of the individual displays.

Brief Summary Text (14):
In some such ganged display embodiments, there are at least two of such ganged displays and

Brief Summary Text (17):
In some such high-bright embodiments, the vehicle includes a computer and a radio connected to provide received digital data to the computer. The computer is programmed to generate animated images from vector-based animation files received over the radio.

Brief Summary Text (19):
According to another aspect of the invention, a mobile display system for publicly showing messages includes an automotive vehicle which carries a publicly visible electronic display and a computer. The computer has: video drive circuitry for generating signals to cause images to be shown on the display, a memory device capable of storing representations of animated display images represented in vector-based form; and programming for enabling the computer to generated animated images from the vector-based animation representations. When a memory device is referred to in this specification, it should be understood than it can include RAM, ROM, flash or other non-volatile memory, hard disk, CD or DVD ROM, including recordable and/or rewritable CD or DVD ROM, and other memory storage devices now or hereafter known.

Brief Summary Text (20):
In some embodiments, the system includes a radio for conveying digital information to the computer about which messages the computer should cause to be shown on the display, and information including the vector-based animation representations of such messages.

Brief Summary Text (23):
In some embodiments the video drive circuitry includes a computer for controlling the images generated on the display and the display-power circuitry can automatically reduce the poser to the display whether or not the computer is operating. In some such embodiments the video drive circuitry includes a computer for controlling the images generated on the display and the display-power circuitry substantially reduces the power supplied to the display without turning off the computer. Later the computer can be shut down and then the power to it can be cut.

In some such embodiments the vehicle further including circuitry which provides power to the computer to turn it back on once the ignition is turned back on.

Brief Summary Text (24):
In some embodiments of this aspect of the invention the display is a backlit display including one or more backlights to illuminate it, and the display-power circuitry reduces power to the backlights. In some such backlit embodiments the backlit display is a high-bright display having backlights capable of providing at least 1000 NITS of illumination before the display-power circuitry reduces power to it. In some embodiments these high bright displays will be LCD displays, but in other embodiments they can include any other types of displays having over 1000 NITs of illumination. In some backlit embodiments the backlit display is a transreflective display which can be lit either by reflected light and/or by backlighting. In some e backlit embodiments, the display-power circuitry makes a first reduction in power at a first time after the ignition is shut off which does not cut off all illuminating power to the backlight. In some such embodiments, the display-power circuitry makes a second reduction in power at a second time, later than the first time, after the ignition is shut off, which turns the backlights off.

Brief Summary Text (25):
According to another aspect of the invention a system for publicly displaying messages comprises an automotive vehicle having the following elements: a publicly visible electronic display; a computer containing programming for causing various messages to be shown on that display; an input device which can be used by an occupant of the vehicle to generate one or more emergency signals; and a connection for supplying the one or more emergency signals to the computer. The computer contains programming to cause it to respond to the generation of an emergency signal by causing an emergency message to be shown on the vehicle's display.

Brief Summary Text (26):
Some embodiments of this emergency signal aspect of the invention further including a radio connected for conveying digital information to the computer about which messages it should cause to be shown on the display and for communicating information from the computer to a remote electronic system; and the computer further contains programming to cause it to respond to the generation of an emergency signal by causing an emergency message to be sent by the radio to the remote electronic system. In some such embodiments, the input device is a switch which generates a single emergency signal; and the computer is programmed to respond to the single emergency signal by causing both the emergency message to be shown on the display and the emergency message to be sent by the radio.

Brief Summary Text (27):
According to one aspect of the invention a rooftop unit, for being carried on the roof of an automotive vehicle is provided. The rooftop unit includes an electronic display having at least 640.times.480 pixel resolution; a computer, having a video interface, for controlling the images shown on the display; and an electrical connection for receiving power from the electrical system of the vehicle.

Brief Summary Text (28):
Some such rooftop units include a radio for conveying digital information to the computer about which messages it should cause to be shown on the display. Some rooftop units include a GPS device connected to the computer, for providing the computer information about the location of the vehicle, and the computer is programmed to use the location information, in conjunction with information received over the radio, in determining which messages to show on the display.

Brief Summary Text (29):
In some rooftop units, the computer contains programming to generate animated bitmapped images on the display from vector based animation representations. The

rooftop unit can include a radio for conveying digital data to the computer; and the computer is programmed to generate the animated images from vector-based animation data received over the radio. The rooftop unit can also include a memory device; and the computer can include programming for enabling it to generate the animated image from vector-based animation files stored on the mass storage device.

Brief Summary Text (30):
In some rooftop units include an enclosure in which the display and computer are enclosed and mountings for suspending the enclosure in a position spaced above the roof of the vehicle. These mounting includes vibration isolators, for at least partially isolating the enclosure from vibration of the vehicle roof.

Brief Summary Text (32):
In some embodiments the external surfaces of the enclosure extends down below the portion of enclosure's bottom surface containing the ventilation holes on at least substantially three sides, to reduce the tendency of rain water to enter the ventilation holes

Brief Summary Text (33):
In some embodiments the rooftop unit includes a radio for conveying digital information to the computer about which messages it should cause to be shown on the display and the radio is enclosed in the unit's enclosure. Some such embodiments the enclosure also holds a geographic location system, such as but not limited to a GPS system, for providing the computer information about the location of the vehicle; and the unit's computer is programmed to use the geographic location information, in conjunction with information received over the radio, in determining which messages to show on the unit's display.

Brief Summary Text (34):
Some rooftop unit further include a connection for receiving an input from an emergency switch that can be operated by an occupant of the vehicle and the unit's computer contains programming to cause it to respond to operation of the emergency switch by causing a predefined emergency message to be shown on the display. Some such embodiments further include a radio for conveying digital information to the computer about which messages it should cause to be shown on the display and for communicating information from the computer to a remote electronic system, and the unit's computer further contains programming to cause it to respond to operation of the emergency switch by causing a predefined emergency message to be sent by the radio to the remote electronic system.

Brief Summary Text (38):
In some of the vehicle display units having an enclosure over the sides and top of their display unit, the enclosure includes top, side, and bottom external surfaces, is substantially waterproof over the top and side surfaces, has holes for ventilation in the bottom surface; and has one or more ventilation fans placed near one or more of the ventilation holes. In some such embodiments one of the fans is positioned to suck air into one of the ventilation holes in the bottom of the enclosure; and a filter is positioned to filter water and dirt out of the air before it reaches the fan. Display units having the substantially waterproof top and side enclosure surfaces can further include an air verticalizing grating shaped to verticalize air flow in the vertical direction. Such a grating can be located over one of the unit's ventilation holes to increase the verticality of air sucked up into the hole, so as to reduce the amount of rain which will enter the hole. This has the benefit of reducing the amount of rain water which will enter the unit, since rain water is often traveling with horizontal component of motion relative to a moving motor vehicle. Display units having the substantially waterproof top and side enclosure surfaces can further have a portion of its enclosure surface extend down below the portion of the enclosures bottom surface containing the ventilation holes on at least substantially three sides. This can be

done to reduce the tendency of rain water to enter the ventilation holes

Brief Summary Text (42):
According to another aspect of the invention a rooftop unit for being carried on the roof of an automotive vehicle is provided. The rooftop unit includes an electronic display; display drive circuitry for driving images on the display; an enclosure in which the display and drive circuitry are enclosed; one or more roof protectors having a total of over two square feet of weight distributing surface shaped to fit the three dimensional curved surface of the roof of a vehicle on which the rooftop unit it is to be mounted; and a plurality of mountings supported by the one or more roof protectors for suspending the enclosure in a position spaced above the roof, which mounting includes vibration isolators, for at least partially isolating the enclosure from vibration of the vehicle roof.

Brief Summary Text (45):
According to one aspect of the invention a system for publicly displaying messages is provided. The system includes an automotive vehicle carrying a publicly visible electronic display; and a computer, having a video interface, for controlling the images shown on the display; and a radio for conveying digital information to and from the computer including information about which messages it should cause to be shown on the display. The computer includes programming defining an operating system having a set of commands and programming to enable a remote system to have remote access to commands of the operating system over the radio.

Brief Summary Text (46):
In some embodiments of this aspect of the system includes a plurality of such mobile systems, each including one of the automotive vehicles carrying at least the display, the computer, and the radio. The system further including a central system which has one or more computer systems and one or more radios connected to the central system computers to enable them to wirelessly communicate with the computers on the mobile systems through the radios on those mobile systems. The computers of the central system include programming for causing the central system to communicate data to the mobile systems controlling what messages are displayed on the mobile systems; and programming for enabling the computers of the central system to obtain remote access of one or more the computers on the mobile systems.

Brief Summary Text (47):
According to another aspect of the invention a system for publicly displaying messages is provided which comprises an automotive vehicle carrying to following elements: a publicly visible electronic display; a computer, having a video interface, for controlling the images shown on the display; and a radio for conveying to and from the computer digital information, including information about which messages it should cause to be shown on the display, and for transmitting to remote computers information supplied to it by the vehicle's computer. The vehicle's computer includes programming enabling it to communicate, over the radio, to a remote computer information about the status of the computer.

Brief Summary Text (48):
In some embodiments of this aspect of the invention there are a plurality of such mobile systems and the system further includes a central system. The central system includes one or more computer systems and one or more radios connected to the central system computers so as to enable them to wirelessly communicate with the computers on the mobile systems through the radios on those mobile systems. The computers of the central system include programming for causing the central system to communicate data to the mobile systems controlling what messages are displayed on the mobile systems; and programming enabling the computers of the central system to request the information about the status of the computer of a given mobile system.

Brief Summary Text (49):

In some embodiments of this aspect of the invention the programming in a mobile unit's computer causes that computer to initiate a communication over the radio about the computer's status in response to the detection by the computer one or more conditions in its status. This can include such changes in status as a running low on space for storage for messages, not having a message stored on the mobile which the mobile unit is to display, when the mobile unit is about to shut down, when it first is booted up, etc.

Brief Summary Text (50):
In some embodiments of this aspect of the invention the mobile unit's computer's video interface includes screen memory used to drive the display, and the information about the status of the computer includes information about the data stored in the screen memory.

Brief Summary Text (51):
In some embodiments of this aspect of the invention a mobile unit's computer includes a mass storage device; and the information about the status of the computer includes information about how full the mass storage device is.

Brief Summary Text (52):
In some embodiments of this aspect of the invention a mobile unit's computer includes random access memory; and the information about the status of the computer includes information about how much random access memory is in the machine.

Brief Summary Text (53):
In some embodiments of this aspect of the invention a mobile unit's computer includes random access memory; and the information about the status of the computer includes information about how much random access memory in the machine is free.

Brief Summary Text (54):
In some embodiments of this aspect of the invention a mobile unit's computer includes one or more central processing units; and the information about the status of the computer includes information about how busy the one or more central processing units have been. In different embodiments this information can be provided for one or more different periods, such as CPU loading over the last second, last 5 seconds, last minute, or last 5 minutes.

Brief Summary Text (55):
In some embodiments of this aspect of the invention the information about the status of a mobile unit's computer includes information about how much traffic there has been over its associated radio.

Brief Summary Text (56):
In some embodiments of this aspect of the invention a mobile unit's computer include one or more memory devices, for storing display messages which can be displayed by the computer on the display; and the information about the status of the computer includes information about what display messages are stored on the memory devices. A mobile unit's one or more memory devices can include RAM, ROM, flash or other non-volatile memory, hard disk, CD or DVD ROM, including recordable and/or rewritable CD or DVD ROM, and other know memory storage devices

Brief Summary Text (57):
In some embodiments of this aspect of the invention a mobile unit's computer includes a network interface which uses the IP protocol to send and receive data packets over the radio. In such embodiments the information about the status of the mobile unit's computer includes information about the IP address of the network interface.

Brief Summary Text (58):
According to another aspect of the invention a mobile display system for publicly

displaying messages is provided which comprises an automotive vehicle carrying the following elements: a publicly visible electronic display; a computer, having a video interface, for controlling the images shown on the display; and a radio for conveying digital information to and from the computer, including information about which messages it should cause to be shown on the display. The computer is provided with programming enabling it to communicate over the radio to a remote computer system real time information about the status of the mobile display unit.

Brief Summary Text (59):
In some embodiments of this aspect of the invention the computer system contains programming to select which of a plurality of messages are shown on the display at a given time: and the real time information indicates which message is currently being shown on the display.

Brief Summary Text (61):
According to another aspect of the invention mobile display system comprises an automotive vehicle carrying: a publicly visible electronic display; a computer, having a video interface, for controlling the images shown on the display; a radio connected to the computer for conveying digital information to and from the computer, including information about which messages it should cause to be shown on the display.

Brief Summary Text (62):
In some embodiments of this aspect of the invention, the mobile system further includes a sensor for providing a measurement of the temperature inside one of the enclosures; a connection for communicating the measurement to the computer; and programming enabling the computer to communicate over the radio to a remote computer system information about the temperature measurement.

Brief Summary Text (63):
In some embodiments of this aspect of the invention, the mobile system further includes a light sensor for providing a measurement of the amount of light falling on the display from sources other than the display itself; a connection for communicating the light measurement to the computer; and programming enabling the computer to communicate over the radio to a remote computer system information about the light measurement.

Brief Summary Text (64):
In some embodiments of this aspect of the invention, the mobile system further includes a connection for communicating to the computer an indication of the amount of light being emitted by the display and programming enabling the computer to communicate over the radio to a remote computer system information about the amount of light being emitted. The display can be a backlit display having a light filter and backlight to provide illumination for the light filter; and the information about the amount of light being emitted includes information about the amount of power being supplied to the backlight.

Brief Summary Text (65):
In some embodiments of this aspect of the invention, the mobile system further includes a connection for communicating to the computer an indication of whether the ignition system is on or off, and programming enabling the computer to communicate over the radio to a remote computer system an indication of whether the ignition system is on or off.

Brief Summary Text (66):
In some embodiments of this aspect of the invention, the radio includes electronics for generating an indication of the strength of the radio frequency signal which is being received by that radio; the mobile unit's computer receives the signal strength indication; and the computer is provided with programming enabling it to communicate over the radio to a remote computer system information about the signal

strength indication.

Brief Summary Text (67):
According to one aspect of the invention a method of displaying messages is provided which includes: carrying a least two publicly visible electronic display at different positions on a moving vehicle, each of which is visible from a different external position relative to the vehicle. The method includes selecting different messages for each of the two different displays as a function of differences between viewers who are likely to see the different displays because of their different position with respect to the vehicle.

Brief Summary Text (74):
Some embodiments of this aspect of the invention further include providing an on-line site from which remote computers can purchasing over a computer network the right to have messages shown on displays, including enabling on-line purchasers to separately select whether to purchase the right to have a message displayed on one or more displays as a function of their position relative to the vehicle which carries them. Such methods include controlling what messages are shown on which of the vehicle's displays as a function of the purchases made on the on-line site.

Brief Summary Text (75):
According to another aspect of the invention a system is provided for publicly displaying messages which includes an automotive vehicle having two publicly visible electronic displays, including a side display that can better be seen from a position to the side of the vehicle, and a back display that can better seen from a position behind the vehicle, and a computer, having one or more video interfaces, enabling it to cause separate images to be shown on each of the displays.

Brief Summary Text (76):
Some embodiments of this aspect of the invention include a plurality of such mobile systems each carrying a communication interface connected to their computer. These systems further include a central system which has one or more computers; one or more communication interfaces connected to such computers; and programming in such computers. This programming enables on-line purchasing over one or more of the central system's communication interfaces of the right to have messages shown on the displays of the mobile systems, including enabling on-line purchasers to separately select whether to purchase the right to have a message displayed on one or more side displays or on one or more back displays. The central system's programming also enables the central system to communicate data to one or more of the mobile systems to control what messages are displayed by the side and back displays of a mobile system in response to on-line purchases.

Brief Summary Text (77):
In some such embodiments the communication interfaces of the mobile systems and the central system which are used for communication between the central system and the mobile systems are wireless communication interfaces, although in others they need not be.

Brief Summary Text (78):
In some embodiments of this aspect of the invention the computer carried by a vehicle includes programming for receiving information about the vehicle's current location and for successively displaying the names of different cross streets near vehicle's current position on the vehicle's back display as the vehicle moves.

Drawing Description Text (12):
FIG. 16 is a highly simplified pseudo code description of programming executed by the processor of the central system to respond to the receipt of locator signals from mobile units in some embodiments of the invention; and

Drawing Description Text (14):

FIG. 18 is a schematic representation of an display system according to one embodiment of the invention which controls the display messages on mobile, fixed, and portable displays, and which enables users, advertisers, and advertising sellers to access and interact with a system over a computer network;

Drawing Description Text (23):
FIG. 27 is a schematic representation of the publicly defined application programmers' interface that the central system's provides to independent programmers to enable them to write software to let remote computers to use the functionality of the central system under independently written program control;

Drawing Description Text (27):
FIG. 31 is a pseudocode representation of the central system's locator signal response programming which is similar to the programming shown in FIG. 16 except that it responds to the identity, number, and/or closeness of wireless units that are near a given mobile unit for which it is determining the messages to be displayed;

Drawing Description Text (37):
FIGS. 42 and 43 are diagrams of components used in a car-top box to provide some of the functionality necessary to convert a motor vehicle into a mobile unit for use with many embodiments of the invention;

Drawing Description Text (38):
FIG. 44 is a diagram illustrating the field of view that a car-top box, such as that shown in FIGS. 42 and 43 as well as in FIGS. 3 through 6, provides;

Drawing Description Text (49):
FIG. 63 is a schematic representation of an aspect of the invention which involves associating different values with the display of messages at different locations and times and calculating a sum of such values corresponding to the locations and times through which one or more vehicles has traveled and using such a sum to charge an advertiser or credit a vehicle operator;

Drawing Description Text (63):
FIG. 78 is a highly simplified pseudo code representation of programming contained within the rooftop box's computer for energy conservation, temperature control, and status reporting;

Detailed Description Text (10):
The central system shown in FIG. 1 further includes a wireless system 134 for transmitting and receiving wireless messages to and from individual mobile units. The wireless system includes both a transmitter 136 and a receiver 138. As will be understood by those skilled in the arts of radio-frequency communication, in many embodiments of the invention, the transmitter and receiver of a wireless system will commonly share many components. The wireless system 134 can be any sort of wireless transmitter currently known or hereinafter invented. In many embodiments of the invention, however, the wireless system 134 will be a cellular phone or a wireless data communication system. In such embodiments, many of the components of the wireless system will be part of wireless systems provided by one or more third party phone companies.

Detailed Description Text (11):
In the embodiment shown in FIG. 1 each of the mobile units 104 includes a controller 140; a first and second separately controllable display 142 and 144, respectively; a global positioning system ("GPS") 146, a speed sensor 148 capable of determining the speed of the mobile unit; a destination input device 150, such as a keyboard, enabling a user of the mobile unit to input information defining a desired destination for the mobile unit; and a wireless system 152 which includes a transmitter 154 and a receiver 156 communicating with the central system 102. The

controller can be a relatively powerful computer system capable of running a major operating system, such as Microsoft's Windows or Windows NT, Unix, or Linux, as smaller computer capable of running smaller operating systems such as those which are often used with embedded controllers.

Detailed Description Text (12):
The displays 142 and 144 can be virtually any type of display capable of showing an electronically encoded image including, for example, liquid crystal, LED, gas plasma, projection display, electronic ink (of the type being developed by Eink Corporation, and similar technologies), electronic paper (such as Gyricon, being developed by Xerox PARC, and similar technologies), and cathode ray tube displays. In some embodiments of the invention, the separately controllable displays 142 and 144 might actually be two separate parts of a single display. In many embodiments of the invention, such as those shown in FIGS. 3-6, FIGS. 42-43, FIGS. 45 and 46, it is preferred that the displays 142 and 144 be at least a VGA resolution display having at least 640.times.480 pixels. In fact, in the embodiments of these figures the side displays 142 are each comprised of three separate VGA or better resolution displays which are ganged together to form one display, and the back display 144 is formed of two separate VGA or better resolution displays which are ganged together to form one display. In other embodiments of some aspects of the invention, a mobile unit's display need not be formed of such high resolutions display, nor need they be formed of such ganged displays.

Detailed Description Text (13):
FIGS. 3 through 6 provide various views of one embodiment of the mobile unit 104. In this embodiment the mobile unit is a taxicab and most of the components identified within the box labeled 104 in FIG. 1 are contained in a car-top, or rooftop, unit 174 shown in FIGS. 3 through 6. In this embodiment the mobile unit's first separately controllable display 142 is actually two displays, one located on each of the longer two sides of the triangularly shaped car-top unit 174. The mobile unit's separately programmable second display 144 corresponds to a smaller display unit that occurs in the back-facing, shorter side of the triangularly shaped car-top box. Such a rear-facing display can display separate content from the side-facing displays, since its content could be tailored to the audience of drivers rather than pedestrians. It should be noted that the vehicle associated with a mobile unit need not be a taxi. In fact, it could include buses, trains, trucks, privately owned passenger cars, boats, airplanes, blimps, and virtually any other type of vehicle.

Detailed Description Text (14):
The mobile unit's controller 140 contains memory 158 that includes programming 160 which controls its operation. It also stores display message IDs 162 and 164, which identify the display messages that are currently to be shown on the mobile unit's two displays 142 and 144. The controller's memory also stores a cache of display messages in the display message storage 166. This cache includes a plurality of display messages 168A through 168N that have been cache after having been downloaded by wireless transmission from the central system 102.

Detailed Description Text (15):
In some embodiments of the invention this display unit's programming 160 includes programming 161 for generating animated video output from vector-based representations of animation. By vector-based animation representations, we mean digital representations which defines animation in terms of one or more patterns each of which can be assigned moving positions relative to a display screen, and at least some of which are defined as scalable geometric shapes. This use of vector-based animation has the benefit of enabling animated, relatively high-resolution images to be generated on a display unit from files or other collections of data that are relatively compact. This reduces the amount of time and bandwidth required to download such messages from the central system, and it reduces the amount of space required to store a plurality of such animated images in the display unit's

display message storage area.

Detailed Description Text (18):
As is indicated in FIG. 8, the data transmitted by the UHF transmitter is comprised of a plurality of data streams 186. Each of these streams includes a plurality of messages 132 of different length which occur at successive times. As will be described below, the central system transmits to each mobile unit an indication of which of the messages contained in one of its data streams the mobile unit should display live, and which of such messages the mobile unit should cache. Such control information is sent through the wireless transmitter 136 shown in FIG. 7 in many embodiments of the invention. In some embodiments of the invention, such instructions are included in one or more of the UHF data streams themselves. As those skilled in the communication arts will appreciate, there are multiple methods by which one or more data streams can be encoded on a high frequency transmission signal such as those generated by UHF transmitter's.

Detailed Description Text (26):
If the display-selection message identifies the selected message as part of a broadcast data stream 186 of the type shown in FIG. 8, step 204 will cause steps 206 and 208 to be performed. Step 206 will cause the data stream receiver 182 shown in FIG. 7 to receive the identified display message, and step 208 will cause the identified display message to be shown on the corresponding display of the mobile unit in real-time. The steps 204 through 208 are only applicable to embodiments of the invention of the type, such as that discussed above with regard FIG. 7, which have live messages broadcast to mobile units through a data channel or stream other than data-selection messages transmitted from the central system's wireless system 134.

Detailed Description Text (31):
FIG. 12 is a schematic representation of a locator signal message generated by some embodiments of the present invention. As is been stated above, the locator signal is generated by a mobile unit to inform the central system of the mobile unit's location. The locator signal 240 includes a header 242; a mobile unit ID 240, which enables the central system to know the identification of the mobile unit generating the locator signal; and GPS coordinates generated by the mobile unit's GPS unit 146 shown in FIGS. 1 and 7, so as to inform the central system of the mobile unit's location.

Detailed Description Text (39):
This programming includes a step 282 that causes steps 284 through 316 to be performed if a locator signal is received from a mobile unit. Step 284 associated a geographic location with the mobile unit that sent the locator signal. In embodiments of the invention in which the locator signal 240 is of the type shown in FIG. 12, the locator signal includes both the mobile unit ID 244 and GPS coordinates 246. In that case, step 284 merely associates in its memory the GPS coordinates 246 with the mobile unit's ID 244 contained in the locator signal. In some embodiments of the invention, however, the locator signal itself does not actually encode the coordinates of the mobile unit, but instead merely includes the mobile unit ID. In such embodiments, as is described below with regard to FIG. 64, the location of the mobile unit is determined by the wireless system 134, such as by detecting the relative signal strength with which the locator signal is received by various receivers in the wireless system, by determining the relative delay with which the locator signal is received by various receivers in the wireless system, or by any of other methods by which the location of a radio signal can be determined which is either currently, or hereafter known.

Detailed Description Text (42):
The next step 292 tests to see if the mobile unit is in a geographic zone for which different display messages should be shown than those indicated by the field 248 contained in the locator signal that has been received. If so, steps 294 through

298 are performed. Step 294 selects the display messages to be displayed by the mobile unit based on the current zone in which the mobile unit is located and the current time, by reference to the schedule 114 described above with regard to FIG. 2. Step 296 sends a display selection message to the mobile unit through the wireless system 134, identifying the selected display messages that are to be shown by the mobile unit. Then, step 298 records the zone, time, and display messages associated with its display-selection message in the billing database 126 shown in FIGS. 1 and 7.

Detailed Description Text (46):
If such a variable frequency locator signal system is being used, step 304 shown in FIG. 16 determines, from the locator signal, a distance from the mobile unit to the boundary of its current geographic zone. In some embodiments, this distance will be the closest distance from the mobile unit to a boundary of a geographic zone. In other embodiments, this distance will be the closest distance from the mobile unit to the boundary of the geographic zone in the direction in which the given mobile unit is traveling. Next, step 306 calculates the length of time before the mobile unit is likely to reach the boundary of its current geographic zone, given the distance determined in step 304 and the speed of the vehicle. Next, step 308 calculates a locator signal period based on the length of time determined in step. Finally, step 310 sends a wireless locator-signal-period message to the given mobile unit containing the locator-signal. As is described above with regard to FIG. 9, this will cause steps 220 and 222 of FIG. 9 to set that locator-signal period 170 shown in FIGS. 1 and 7. If the central system is sending a display-selection message to the given mobile unit at approximately the same time that it desires to send a locator-signal-period value to the mobile unit, it can include the locator-signal period in the display-selection message, as is indicated by the field 234 in FIGS. 10 and 11.

Detailed Description Text (47):
If the locator signal that has been received by the central system includes an intended destination designation 254 of the type shown in FIG. 12, step 312 will cause steps 314 and 316 to be performed. Step 314 selects a subset of display messages that are appropriate for a mobile unit to cache given its current location and the intended location identified by the field 254 shown in FIG. 12. Then step 316 sends a wireless message to the mobile unit informing it to cache the selected subset of display messages. In some embodiments of the invention, the caching message sent by step 316 will actually include the content of the display messages that are to be cached within it. In other embodiments of the invention, the caching message will identify messages that are to be received and cached from another communication channel, such as from one of the broadcast data streams 186 shown in FIG. 8, which can be broadcast to the mobile units, such as by the UHF transmitter 176 shown in FIG. 7.

Detailed Description Text (49):
FIG. 18 illustrates another embodiment of the invention. In this embodiment, the central system 102B controls the display of messages upon more than just mobile display units, such as the cab mobile unit 104B and the bus mobile unit 104C, shown in FIG. 18. It also controls the display of messages upon one or more fixed display units, such as the fixed display 344 shown in FIG. 18, and upon one or more wireless portable computing devices, such as the personal digital assistant (PDA) 340 shown in FIG. 18.

Detailed Description Text (50):
The central system 102B is connected through a computer network to a wireless transmission system 134, indicated by an image of a cellular antenna tower shown in FIG. 18. Through this wireless system the central system can communicate with the various display units and portable computing devices shown in FIG. 18. As stated above with regard to FIGS. 1 and 7, the wireless system 134 used by the central systems of various embodiments of the invention can be either a separate

transmitter and/or receiver dedicated to the use of the central system or a wireless system operated by a third-party wireless data communications provider, such as a cellular phone and data network. In the embodiment of the invention indicated in FIG. 18 the wireless system 134 is of this latter type, although in other embodiments it need not be.

Detailed Description Text (51):
In many embodiments of the invention, shown in FIG. 18, the central system also has the capability to communicate with at least some of its display units through a UHF transmitter 176 similar to that described above with regard to FIG. 7.

Detailed Description Text (52):
The computer network 348 shown in FIG. 18 is intended to represent a generalized communication network, which can include telephone, wireless, and data communications, including in many embodiments a network of computer networks, such as the Internet. The central system 102B is connected to the network 348 not only for the purpose of communicating with its display units through the wireless system 134, but also for the purpose of communicating with other types of devices, such as one or more external computer systems 350; one or more other types of computer devices, such as the PDA 340B; and/or one or more telephones 352. The central system 102B uses its connections with such devices to enable people to purchase, and control the content of, messages displayed by the system; to interact with and respond to the system's messages and display units; and to enable users to interact with various forms of information stored in the central system.

Detailed Description Text (53):
The central system 102B of FIG. 18 includes an online advertising e-commerce site 352. In many embodiments of the invention this will be a World Wide Web site. This advertising e-commerce site includes advertising marketplace-programming 354 to enable users to purchase the right to display advertising on the systems various display's during one or more geosynchrons. A Geosynchron is a given combination of one or more times, locations, and other condition. The central system 102B also includes advertising uploading programming 356 to enable users to upload over the communication network 348 advertisements which they desire to be shown during given geosynchrons which they have purchased the rights to. The online site 352 also includes advertising response programming 358 which enables people who have seen messages displayed on the system's various display screens to interact with such display's.

Detailed Description Text (56):
FIG. 19 is an alternate representation of the system shown in FIG. 18 that has a form more similar to that of the diagram in FIGS. 1 and 7. In FIG. 19 some of the computer systems 350 are labeled as consumer computers 350A, some as advertising buyer computers 350B, and others as advertising seller computers 350C. A single computer can function as any one of these types of computers, depending on its use. An advertising buying computer 350B refers to a system that is being used by an advertiser, or someone acting on behalf of an advertiser, to obtain information about the placement of advertising or to place advertisements through the system. An advertising seller computer 350C refers to a system that is being used by those who wish to sell, through the central system, advertising availabilities on displays that they control. They could be the operators of the central system, or third parties who control fixed, mobile, or portable displays which can be controlled by the system. A consumer system 350A refers to a computer that interacts with the central system for purposes other than those relating to the selling or buying of advertisements. The only other element shown in FIG. 19 which is not explicitly shown in FIG. 18 is the network interface 374, which represents any type of network interface capable of interfacing with one or more computers of the central system to the network 348.

Detailed Description Text (59):

The mobile unit 104D includes multiple external displays 142 and 144; a global positioning system 146; a speed sensor 148, which can be, for example, the speedometer of the vehicle or part of the GPS system; a wireless system 152; a UHF receiver 180; a controller 140; and a memory 158, all of which are similar to the similarly numbered elements shown in FIGS. 7.

Detailed Description Text (61):
The mobile unit shown in FIG. 20 also includes one or more cameras 380 and an image capture device 378 for communicating between the one or more cameras 380 and the controller computer 140. Although in some embodiments of the invention one or more of the cameras 380 can be cameras using chemically developed film, in many embodiments they will be electronic cameras, either digital still image cameras or video cameras. In many embodiments of the invention video cameras will be used, since they can capture moving images, which are often more interesting to the eye. As will be explained below in more detail, the mobile unit's camera can have many uses, including recording information about the potential audience for a mobile unit's messages at various locations and at various times; recording information about traffic at various locations and various times; recording images for real-time display on the mobile unit's display screens; and recording images of the one or more metropolitan areas in which the mobile unit travels for the purpose of creating a visual database of such one or more metropolitan areas.

Detailed Description Text (62):
The mobile unit shown in FIG. 20 further includes a local communication device 382 that is capable of communicating directly with local communication devices of the same type that are relatively close to the mobile unit. The local communication device 382 can be any type of communication device capable of performing such communication. This includes infrared communication devices, and various radio-frequency wireless communication devices, such as communication devices complying with the Bluetooth communications standard.

Detailed Description Text (69):
The one or more driver speakers 388 are provided to enable the computer 140 to provide audio output to a driver. For example, the driver speaker can be used to inform the driver when he or she is approaching locations in a route at which he or she should make turns. In taxicab embodiments, the driver speakers can be used to enable the driver to receive instructions or information from the dispatcher (whether it be a human or a computerized system) without having to take his or her eyes off the road. The driver speaker can be used for any other purpose for which speakers are used to interface to drivers of automobiles, including providing news, traffic, and weather information.

Detailed Description Text (70):
The driver input 392 includes one or more input devices such as a keyboard, pointing device, or touch sensitive screen on the driver display, which enable the user to input information into the computer 140. This can be used to enable the user to enter a desired destination to which the mobile vehicle is to travel. If the mobile unit is a taxicab, the driver input can be used to enable the user to enter a desired destination as well as the status of the cab, including whether or not the cab is off-duty, has just taken a fare, or is driving to pick up a fare. The driver input 392 is also used to enable a driver to perform any other interactions that he or she may so desire to do with the computer 140.

Detailed Description Text (71):
The driver microphone 390 is used to enable a user to talk to the computer 140 and/or to the system as a whole. The computer 140 can record audio of speech spoken by the driver as well as audio occurring in the cab. In many embodiments either the controller 140 or the central system will have speech recognition capability to enable spoken input from the driver to be converted into text or commands.

Detailed Description Text (72):
In the embodiment of FIG. 20, the memory 158 of the mobile unit's controller 140 includes programming 160 which contains many of the aspects of the programming 160 shown in FIGS. 1 and 7 discussed above. This memory also stores selected message IDs 162 and 164, display messages 168A through 168N, a locator-signal period 170, and a destination 172, as described above with regard to FIGS. 1 and 7. In addition, it stores driver earning data 394 which enables the driver display 386 to provide a driver with information of his earnings based on the amount of money his or her mobile unit has made displaying messages at various geosynchrons, that is, at various combinations of time and place and other possible conditions which the system uses to control the display of messages on its display units. The memory 158 can also include a geosynchron earning database 396, which contains information that can be displayed on the driver display 386 to help a driver decided the earning potential associated with driving through different locations at different times under different conditions.

Detailed Description Text (74):
The passenger interface 400 can be used for different purposes. It can be used to enable passengers to surf the Internet, and or send and receive e-mail. It can also be used to provide the passenger with paid audio and visual programming, or with audio and visual programming paid for by advertising. In many embodiments providing the passenger with paid audio and video programming, the mobile unit's controller 140 includes programming 410 which keeps track of the passengers usage of the passenger interface and charges him accordingly. The amount of this charge can be added to the taxi fare calculated for the passengers' trip. The amount of the taxi fare and any charges for the use of the passenger interface can be displayed on the driver interface display 386 as well as on the passengers' display 402.

Detailed Description Text (75):
In some embodiments of the mobile unit, shown in FIG. 21, advertising messages are shown on the passenger display 402 and/or sounded on the passenger speaker 404. In such case the content of such messages can be selected by the system in response to conditions such as the location of the mobile vehicle, the destination of the passenger in the mobile vehicle, the time of day, day of the week, or date of the month, and other factors, such as information which the passenger has entered on the passenger interface 400. Such message selection can be performed by software 412 contained in the mobile unit's controller 130, or computers of the central system can select it.

Detailed Description Text (78):
The non-mobile unit further includes a local communication device 382A similar to the local communication device 382 described above with regard to FIG. 20. This device enables the non-mobile unit to interact with people and electronic systems in its locale, which have similar local communication devices. The non-mobile unit further includes a wireless system 152 to enable it to receive messages providing it with instructions as to what messages to display as well as other instructions. In some embodiments, the non-mobile unit will include a UHF receiver 180 to enable it to receive message content and other data transmitted to display units of the overall display system by a UHF transmitter.

Detailed Description Text (80):
FIG. 23 is a highly simplified pseudo-code representation of the programming 420 associated with the online advertising site 352 shown in FIGS. 18 and 19. In many embodiments of the invention, the site will be a World Wide Web site, but in other embodiments it can be other types of online sites, such as, for example, ones connected to a private virtual network. As shown in FIG. 23, this site includes programming 422 that allows a user to cause a plurality of different things to happen. In a web-based embodiments of this aspect of the invention, the e-commerce site downloads web pages which provide an interface allowing a user on a client computer with a browser to select many of the user options provided by the e-

commerce site by of pointing and clicking with a computer pointing device, such as a mouse.

Detailed Description Text (89):
As indicated by the numeral 438, the central system's online site also allows users to see traffic information collected from mobile units, with the ability to see that information for given location and given periods of time. For example, if a person wanted to know how heavy the traffic was on a given roadway at 4 PM on average workday evenings, he or she would be able to go to this database and obtain this information for many of the locations served by display units associated with the online site. In many embodiments of the systems the traffic database will also incorporate information from sources other than the display system's own display units, such as government sources reporting on current traffic conditions, or local newspaper, radio, and/or TV organizations that have traffic information. The data in this traffic database can include not only image records of traffic at various locations and times, including the current time, but also statistical information which has been manually or automatically derived from such images, as well as information derived from locator signals generated by mobile units, and information derived from speed sensors on such mobile units.

Detailed Description Text (91):
As indicated by the numeral 441, the central system's online site includes an interface enabling users to navigate a visual image of the city, both by location and time. Although this visual database may include only 2-D images in some embodiments, in many others this visual database will be comprised of 3-D images derived from 2-D images taken by cameras located both on mobile and fixed units. As is well known in the art of image processing, it is possible to drive 3-D images of a scene from multiple 2-D images of it. This process can be used to create a virtual city composed of the many images taken by the system's mobile and fixed display units. Furthermore, the system can include images of the city at various times of day, various times a year, or it various times over a period of years to make the virtual city seem even more alive.

Detailed Description Text (92):
Preferably users are able to navigate to given locations in this virtual 3-D city or metropolitan region in multiple different ways, including: identifying specific addresses; by driving through its by means of virtual travel; by selecting one or more locations from an aerial or satellite view and then selecting to see that locale at a street level view; and/or by selecting various advertisers or other prominent locations within the metropolitan area and selecting to see how they appear within the virtual city. Organizations, such as stores, public transportation authorities, and museums can cooperate with the central system's Internet site by provide 3-D images of their own interiors, which could be linked into the visual database so that they could be navigated in as part of the 3-D space represented by the visual representation.

Detailed Description Text (97):
If the user selects a particular geosynchron display through the use of a geosynchron display interface, steps 448 and 450 will cause the central system's computer to generate and show to the user the particular display of a selected set of geosynchrons.

Detailed Description Text (99):
As is indicated by the numeral 512 and 514, it enables a user to select to see available geosynchrons according to their associated type of display, such as fixed displays; mobile displays, including taxi or bus displays; or portable computer devices, such as PDA's; or the location of a vehicle mounted display relative to the vehicle it is mounted on. Once geosynchrons associated with one or more of such display types, including side and back vehicles displays, have been displayed, a customer can select have one or more of its messages shown on one or more of such

displayed geosynchrons, as described above with regard to numerals 1182, 1184 and 475 through 482 in FIGS. 24A and 24B.

Detailed Description Text (103):
As indicated by numeral 526, the interface also lets users specify one or more locations of the geosynchrons he or she wants displayed. This can be done by navigating on a map and changing the scale of view. It can also be done by enabling a user to enter, if desired, a distance from such a given location, class of locations, given event, or class of events.

Detailed Description Text (124):
As indicated by the numerals 624 through 627 of FIG. 26B the geosynchron selection interface enables a user to define criteria relating to the price of desired geosynchrons. This includes criteria specifying that the selected geosynchrons be in a specified least or most expensive percentile of the geosynchron pool. The user can also select that the selected geosynchrons be over or under the running average price for the region; that the geosynchrons' price be less than or greater than a specified dollar amount and that the geosynchrons have a small or high price fluctuation. As indicated by numeral 627 the user can also specify a total price limit for a group of geosynchrons that are to be searched for. This allows the system to seek to best match a user selected set of criteria, while keeping the total price at or below a given limit. Other price parameters could also be used, and the selection of price parameters provided could vary depending upon whether or not the user has selected to show geosynchrons purchased at a fixed price or through an auction.

Detailed Description Text (136):
As was stated above with regard to FIG. 19, an advertiser seller can either be a person working for the central system who is offering geosynchrons on displays owned or controlled by the central system for sale, or can be a third party offering for sale geosynchrons on displays which the third party owns or controls. In fact, in some embodiments of the invention, the entity which owns the central system may not, in fact, own any of the displays used with the system and may merely act as intermediary for selling, buying, and/or controlling the selection of messages to be displayed in geosynchrons involving such third party displays as a function of time, location, or other conditions.

Detailed Description Text (144):
As indicated in FIG. 28, in some embodiments of the invention, the central system's advertisement selling site will have a public, or open, API, or application programmer interface, to enable third party software designed to run on clients of the site to automatically interface with its programming. There are many known methods for enabling programming running on a client computer to interact with programming running on a server computer. Any of these known methods, or any such method developed in the future, can be used to give the central systems advertising selling site an API with which third party programming running on client computers can interact.

Detailed Description Text (147):
The bidForGeosynchron function 676 of FIG. 28 enables a user to place a bid for a given geosynchron. The showCurrent GeosynchronBid function 677 enables a third party program to find the current value of the highest bid for a given geosynchron. The uploadad function 678 enables an authorized user to upload an advertisement message for storage in the display message storage area 130 of the central system, which is shown in FIG. 18. The pickAdForGeosynchron function 679 enables an advertiser, who has a geosynchron ownership ID indicating he has the right to determine the one or more messages to be displayed during a given geosynchron, to associate an ad ID, which has been returned by a previous performance of an uploadad function 678, with that geosynchron. The getGeonForCensusBlock function 680, the getGeonForCoordinates function 631, and the getGeonForAddress function

682, respectively, return the identification of a Geon corresponding to a given census block, to a given set of coordinates, and to a given address. As stated above, a geon corresponds to one or more geosynchron's location, independently of time or other conditions. The getGeosynchronForGeon function 683 returns the geosynchronID of the geosynchron associated with a given geon at a given time. The getInfoOnGeosynchron function 684 returns a set of information on a given geosynchron defined by the info form field.

Detailed Description Text (161):
As indicated by numeral 701, the user can select that the message be displayed automatically upon proximity to a given wireless device, provided the wireless device is of a variety that can be used to automatically indicate its own location to the system. For example, this would enable a person to send a personal message to a person who normally carries such a portable device with them when the person is in close proximity to one or more display units. In some embodiments, the system can be programmed by the person ordering the public display of such personal message to automatically have a private message sent to the recipient of the message, such as to his or her wireless phone or PDA, to notify him or her to look at the public message, and/or to provide other information in association with the message, such as voice information synchronized with the visual display.

Detailed Description Text (162):
As indicated by the numeral 702, the user can select to have the personal message triggered at an exact time and location indicated by a user command, such as by a message sent from the Internet, from a phone, or from a wireless device such as an i-phone or a PDA. For example, this will enable a person who is eating in an outside restaurant with a date to indicate the time at which she or he wishes a fixed or mobile unit in a desirable location to display her or his personal message to her or his date.

Detailed Description Text (164):
FIG. 30 represents programming 705 in the central system to enable it to respond to people who have seen messages shown on its display units. As indicated by step 706, and the steps below it, the software includes programming to enable it to respond differently to different types of ad response messages. Such ad response messages can be sent by multiple types of devices, including, for example, wireless data devices, wireless telephones, landline phones, Internet devices, or local communication devices of the type discussed above with regard to the local communication devices 382, shown in FIGS. 20 through 22.

Detailed Description Text (166):
In many embodiments of the invention, the time and location associated with such an ad response can be determined automatically without the need for the individual sending such a message to enter such information. For example, if users of certain types of wireless devices transmit messages to the central system when they see the display of a message in which they are interested, the central system will automatically be able to determine the approximate time of the advertisement in which they are interested by the time of the receipt of the message and the approximate location of the message by the automatic location sensing features which are provided by certain wireless networks. This makes it easy for users to respond to any display message they see merely by contacting one address, whether it be a phone number, a web address, or other network address.

Detailed Description Text (171):
If the central system receives a "shown me" request, step 746 causes steps 748 and 750 to be performed. Step 748 tests to see if the location of the requester can be identified with sufficient accuracy, such as through the location capability which is built into some wireless systems, and, if so, whether or not the display system's message schedule allows the display of a "show me" image. If so, step 750 causes the local display unit's camera 380 or 380A, of the type shown in FIGS. 20

through 22, to take a picture of the location associated with the source of the request and to display it on one or more of its display screens.

Detailed Description Text (174):
In many embodiments of the invention, the display control programming 360, shown in FIG. 18, controls which messages are to be shown by a given mobile unit based on more than just the location and time. The other factors which can be taken into account in determining which messages should be displayed can include the identity of, the number of, and or the closeness of wireless units whose location and identity can be automatically detected by a wireless network; speed or other operating characteristics of the mobile unit upon which the display is to be made; weather conditions; the number of people in the audience; the occurrence of certain events near the location of the display, such as and accident, fire, traffic jam, sporting event, entertainment event, etc.

Detailed Description Text (175):
FIG. 31 illustrates a portion of the central system's locator signal response programming in one embodiment of the invention which is similar to the programming described above with regard to FIG. 16, except that it has been modified to take into account the presence of wireless units near the location of a display unit in determining which messages should be shown on that unit. All of the portions of the programming 280A are identical to the corresponding portions of the programming 280 shown in FIG. 16, except for the portions that are shown in FIG. 31. In FIG. 31 the programming includes an additional step 790, which obtains information from a wireless network about the identity, number, and/or closeness of wireless units near the location of a given mobile unit to which the central system is responding. In some embodiments of the invention, the step 790 will only be taken if the schedule currently allows for messages at the current location of the mobile unit that depend on the nearby presence of wireless devices.

Detailed Description Text (176):
Then, step 292A tests whether or not the mobile unit is in a geon, or geographic zone, for which a different display message should be shown than those which the locator signal indicates that the mobile unit is currently displaying, or if the identity, number, and or closeness of wireless units near the mobile unit indicates that a different message should be shown. If this is the case, then step 294A selects the display message to be shown by the mobile unit based on the sound, current time, and identity, number, and closeness of wireless units identified in the area. It does this by referring to a message schedule 144A of the type shown in FIG. 18. This message schedule indicates which messages are to be shown at which geon's at which time under different conditions relating to the identity, number, and or closeness of nearby wireless units.

Detailed Description Text (177):
The programming of FIG. 31 will enable a display unit to display messages that are addressed to one or more particular individuals whose wireless units are detected near it. For example, such messages could include the name of such an individual or even perhaps a picture of him or her. Also, the subject matter of messages can be altered to reflect the identity of one or more people whose wireless devices have been detected near the given display unit. Furthermore, the visual characteristics of the displayed message can be altered based on the distance of such people from the display unit. Thus, if the wireless devices detected are located far from the display a message with large images and letters could be used, whereas if they are close to the display a message containing smaller image features and text could be shown.

Detailed Description Text (178):
FIG. 32 is similar to FIG. 31 except that in it the central system's locator signal response programming 280B takes into account information about the speed of the mobile unit in step 792 and uses that information in steps 792B and 794B in

selecting which display messages are to be shown on the mobile unit. In some embodiments of the invention, information about the relative difference between the speed of a given display unit, whether be fixed or mobile, and people in its potential audience could be used instead of just the speed of the display itself. For example, the unit or fixed display might alter the messages it is displaying based on the speed of traffic going by it. Such relative speed can be determined by multiple methods, such as by use of a display unit's cameras, or by determining the speed of wireless units that are traveling past the display unit inside passing vehicles.

Detailed Description Text (179):
In other embodiments of the invention which operate more like the mobile display system described in the Cohen patent, in which decisions about which messages are shown in which geographic zones at which times are made by computers on mobile units themselves, other factors such as the identity, number, and or closeness of wireless units near a mobile unit, or the speed or other operating conditions of a mobile unit can be used by such a mobile unit itself in deciding which messages should be displayed at what times. In many such embodiments of the invention, the central system would normally send down multiple messages for a given geosynchron and the mobile unit itself would decide which of these various messages were to be display at a given time and place.

Detailed Description Text (182):
This programming includes a step 796 that uploads images from the camera to the central system. In many embodiments only selected images will be uploaded and they will be compressed before being uploaded to reduce communication bandwidth requirements. In some embodiments of the invention some or all of this uploading will be performed when a mobile unit is parked for the night through means of a landline connection, such as a cable modem, DSL, or other wired data connection to the central system. Most current wireless transmission standards still provide very low bandwidth. But, it is technically feasible to build high bandwidth wireless systems today, and within several years it is expected that widely available wireless networks will provide a sufficiently high bandwidth to enable mobile units to upload real-time still and video images to the central system.

Detailed Description Text (183):
Step 398 of FIG. 33 uses comparison with one or more portions of the 3-D metropolitan image created by the system to help the computers on the mobile unit more accurately recognize what parts of the image its cameras are capturing correspond to cars and people, which, of course, are not normally part of the permanent 3-D model. This helps a system perform audience and traffic counts since it makes it easier to determine which parts of an image correspond to people, to cars, and to the relatively constant aspects of a given street location. The comparison of video being captured by the unit's camera with the system's video database also reduces the amount of information that needs to be uploaded, since in many instances much of the information being imaged is already contained in the system's visual database. With current technology, it would be expensive to store a detailed visual database of an entire city within a mobile unit, but within five to ten years all or a significant part of such a database should fit within one hard drive. Also, within several years standard wireless network bandwidth will be high enough to enable the central system to download to a mobile unit the portions of a city's visual database as needed for such comparisons. At the present, it would be possible to store a portion of a city's visual database on a mobile unit for purposes of such comparison.

Detailed Description Text (186):
As indicated by steps 806 and 808, if certain specific conditions are met, the mobile unit will show images recorded by it's one or more cameras on its display screen. Normally these will be live images, but they can also be previously recorded images. One of the conditions, which can give rise to the display of such

images, is that of a "show me" request described above with regard to steps 799 and 800. Camera images might also be shown on the units display to draw attention to the display or as part of contests that provide incentives to persons who wave or display designated signs toward a mobile or fixed unit with a camera. Rewards might be as small as a zoomed close-up of the person waving, and or might be as large as a significant prize.

Detailed Description Text (187):
As indicated by step 810, in some embodiments of the invention the computer on a mobile unit might compare the image being derived from its one or more cameras against 3-D projections from the systems 3-D model of the metropolitan area to help the mobile unit determined its exact position. Such a system can be used in conjunction with, or independently of, other locating systems, such as the GPS system 146, shown in FIGS. 20 and 21. When operating in a location for which the central system already has a good 3-D image model, this will enable the system to determine very accurately the mobile unit's location. It also has the advantage of being able to operate in locations where GPS signals are difficult to receive, such as in tunnels or in the shadows of some buildings.

Detailed Description Text (192):
It should be understood that in different embodiments of the invention a different distribution of the functionality shown in FIGS. 32 and 33 can be made between the computers of local display units, such as fixed and mobile units, and the computers of the central system. For example, in some embodiments of the invention vision recognition can be performed at the central system, although this has the disadvantage of requiring a relatively large bandwidth for the upload of information, or the requirement of low resolution or low frequency image uploads. In some embodiments of the invention, information can be derived from uploaded images by human vision recognition rather than machine recognition.

Detailed Description Text (200):
As indicated by step 820, if visual recognition has not be performed by the display unit uploading image information, the central system can use visual recognition programming or hardware to estimate the number of vehicles, the speed of vehicles, and other traffic conditions at a given time and place, and record them in the central system's traffic database. Of course, visual images of the traffic themselves can also be stored in the traffic database. This database enables the drivers of the system's mobile units to find more effective routes at various times and places, and provides valuable media content, which can be sold by the central system, which can be used to attract audiences to its website, or which can be displayed on the outdoor displays of the system.

Detailed Description Text (201):
As indicated by step 822, the central system uses visual recognition software to estimate weather conditions and record conditions in a weather database that is associated with the time and location in which such images were recorded. In addition, visual images of the weather can be stored in this database. Like the information in the traffic database, the information in the weather database can be used to help drivers of the system's mobile units; can function as valuable media content which can be sold or licensed by the central system; can be used to attract audiences to its website; and/or can be displayed on its outdoor displays.

Detailed Description Text (202):
As indicated by steps 823 through 838, the programming of the central system can use visual recognition to vary the messages shown by its mobile units'displays based on different conditions determined from images derived from the systems' cameras, including: estimations of the number people who can see the display; estimations of the speed of vehicle or nearby vehicles; estimations of the age, sex, race, social class of people around the display; estimations of current weather conditions; and estimations of current lighting conditions.

Detailed Description Text (203):
As indicated by steps 838 through 842, the central system can use vision recognition techniques to detect the behavior of persons in the vicinity of one of its displays, including behaviors relative to the display, and respond accordingly to such behaviors which indicate recognition by a person of the display or attention toward it. Such behavior could include waving toward the display, pointing ones hand toward the display, pointing ones head toward the display, having one's eyes looking toward the display, or making a specified gesture which the system has informed people will cause the system to respond to them. If the system detects such behavior from a person in its images, step 842 can respond by giving such a person a reward, if they identify themselves, such as through use of a wireless device, or if the display is a fixed display by entering information on an input device associated with that display, or by later contacting the system's website and providing photographs which correspond sufficiently to the images of them taken by the display's camera. As indicated by step 842, when the system detects a person making a particular behavior toward it, such as looking at or waving at the system, the display can show a picture of that person. Also as is indicated in step 843, the system can record the person's sign of recognition toward the display for statistical purposes, such as showing advertisers the number of people who look at or respond to the system's display.

Detailed Description Text (205):
FIG. 35 illustrates the central system's programming 846 for synchronizing displays between multiple different display units. If the current location of two display units is close enough to be seen by the same people, and if other conditions, such as scheduling and location conditions, are right, then step 848 causes steps 850 through 858 to cause a synchronous display to take place. The display units involved can be multiple mobile units, one or more mobile units and one or more fixed units, or two or more fixed units.

Detailed Description Text (206):
If these conditions are met, step 850 instructs the displays which are close to each other to display a message in synchronism.

Detailed Description Text (209):
The purpose of such a synchronized displays is to capture the attention of potential viewers toward the display system and the messages it shows. In some cases, the synchronized messages will be advertisements for the system itself. In other instances, advertisers will pay for such synchronized messages. In other embodiments of the invention, the control of synchronized messages could be controlled directly by the computers on one or more local display units themselves.

Detailed Description Text (211):
As indicated in FIG. 36, if the central system detects that the location of a mobile unit is close enough to a specific location for the display of a location varying message, and if other conditions, such as availability for such a message in the message schedule, allow the display of such a message, steps 862 and 864 will instruct the mobile display to show a location varying message appropriate for that specific location.

Detailed Description Text (231):
If the system receives a request, such as from over the Internet, to see historical information on how long it takes to go from one location to another by cab, step 962 and 964 will send out a page in response to that request enabling a user to obtain historical information from the cab database about the length of time for such trips in the past at various selected times and weather conditions.

Detailed Description Text (232):

As shown in FIG. 39B, if the central system receives a request to pick up a fare at a first location for a trip to a second location as soon as possible, step 966 will cause step 968 through 984 to be performed. Step 968 determines which, if any, cabs are free or are likely to be free soon and their locations from the cab database. Then, a step 970 calculates the likely time for the closest of such cabs to reach the first location. Then, step 972 calculates the likely time of a trip from the first location to the second location, taking into account current traffic and weather conditions and past historical traffic information. Then, step 974 sends the user information on such cab time calculations and asks the user if she or he wants to commit to booking such a cab trip.

Detailed Description Text (237):
Once this information has been uploaded to the central system, such as over a wireless network, step 998 causes the central system to record such information relating to vehicle position, time, and speed. If the uploaded information does not explicitly include the vehicle's speed, that information can be calculated overtime by measuring the amount of distance between the locations at which a given vehicle make successive reports of its location. As indicated by the numeral 1000, the central system repeatedly calculates the speed of traffic flows at multiple locations from the information it has recorded in step 998 and from other information which is available to it, such as from other sources of traffic information.

Detailed Description Text (240):
FIGS. 42 and 43 provide views of one embodiment of a car-top, or rooftop, box 174 that can be used to provide many of the components necessary to convert a standard motor vehicle into a mobile unit for use in a mobile messaging system of the type described above. This car-top box, when covered by its plastic external shell, which is not shown in FIGS. 42 and 43, has the appearance shown in FIGS. 3 through 6.

Detailed Description Text (241):
The car-top box 174 includes a plurality of components mounted upon a base 1026, which in turn is mounted on the roof of a motor vehicle through isolation mounts 1024. These isolation mounts are important because they decrease the amount of vibration that the rooftop box receives during the travels of the vehicle to which the rooftop boxes attached, and, therefore, they significantly decrease vibration damage to the components of the unit 174.

Detailed Description Text (242):
The rooftop box includes three separate displays, including two displays 142 shown in FIG. 6 on its two long triangular sides and one shorter display 144 on its shorter, back side. The two side displays 142 are each ganged displays made of three individual LCD display panels 1036, shown in FIG. 42, grouped together to operate as one display. The back display 144 is a ganged display made from two individual LCD display panels 1036 grouped together to operate as one display. The multiple LCD display panels 1036 of each display are held in place by a frame 1023. The bottom side of each frame includes a support flange 1032 that includes holes through which bolts can be used to secure the frame and the LCD panels it supports to the base 1026 of the car-top box.

Detailed Description Text (243):
Each LCD display panel has an associated LCD driver board 1021 that drives the pixels of that display. Each such display also includes a video display board 1022 that receives as an input video signals generated by a computer video display board and provides as an output signals that drive the LCD drive board 1021. At each of the three corners of the triangle formed by the three displays 142 and 144, a corner bracket 1025 is used to connect the panels. In some embodiments of the car-top box a ventilation fan 1027 is provided to cool the electronics in the car-top box. However, is been found that such a ventilation fan is not necessary in all

environments.

Detailed Description Text (244):
The car-top box is provided with an industrial grade computer 1030 that corresponds to the mobile unit controllers 140 shown in the mobile unit block diagrams of FIGS. 1, 7, 20, and 21. A wireless CDPD modem 1031 is provided which corresponds to the wireless system 152 shown in the mobile unit block diagrams. An antenna 1035 is provided for the wireless modem. A global positioning receiver 1033 is provided which corresponds to the GPS receiver 146 shown in such diagrams.

Detailed Description Text (246):
FIG. 44 illustrates one of the advantages of a car-top box having a triangular set of displays as is shown in FIGS. 42 and 43. This advantage is the field of view such a rooftop box provides for its displays. In FIG. 44, a top view of a mobile unit 104, similar to that of FIG. 6, is shown slightly above the center of that figure, with the mobile unit's vehicle pointing in a downward direction in the figure. Emanating from the location on the roof of this mobile unit corresponding to its rooftop box 174 are three triangular shaped areas that correspond to the zones of view of each of the mobile unit's three displays 142 or 144. At the mobile unit's sides are two zones of view 142V each associated with one of the mobile unit's two side displays 142. Emanating from the rear of this vehicle is a zone of view 144V associated with its back display 144. As can be seen from FIG. 44, this combination of three displays provides views from all directions except those in front of the mobile unit, in which location the displays might prove most distracting to oncoming drivers.

Detailed Description Text (247):
In other embodiments of the invention, differently shaped triangular car-top boxes can be used to provide a similar advantage. For example, all three sides of a triangular car-top box could have similar sized displays, which would have the advantage of making it computationally easier to have all three displays show the same message when so desired.

Detailed Description Text (248):
Of course, in other embodiments of the invention, a car-top box can use a shape other than a triangular one for its displays. For example, it could just have two opposing displays having a longest dimension, which runs parallel to the length of the vehicle upon which it is mounted. In other embodiments, the car-top box could have four displays, each located along one side of a rectangular shape, so the mobile unit would have one display visible from each of its front, back, and two sides.

Detailed Description Text (249):
FIGS. 45 and 46 are block diagrams illustrating some of the components of the car top box shown in FIGS. 42 and 43.

Detailed Description Text (250):
FIG. 45 shows that the GPS receiver 1033 is connected to an antenna that is built into its package to receive GPS signals and is also connected through a communication port to the computer 1030. It also shows that the CDPD wireless modem 1031 is connected to the antenna 1035 to receive and transmit wireless transmissions and that this modem is connected through a communication port with the computer 1030, so as to send data it receives from the wireless network to the computer, and to transmit to the wireless network data it receives from the computer.

Detailed Description Text (251):
As shown in FIG. 45 the computer 1030 includes five video ports, three of which are used to drive three of the panels associated with each of the side displays 142, and two of which are used to drive the two displays of the rear display 144 shown

in FIGS. 42 and 43. As shown in FIG. 45, the three video outputs that go to the two displays 142 go through a two-way video splitter 1042 for the purpose of splitting each such video output into two identical video signals, which are sent to corresponding LCD panels on each of the two displays 142.

Detailed Description Text (253):
The digital view controller, or video display board, 1022 associated with each LCD display panel 1036 receives one of the split video outputs produced by one of the splitters 142 shown in FIG. 45 from either the video 1, video 2, or video 3 lines shown in FIG. 45. As stated above each such video display board 1022 receives a video input produced by video board of the computer 1030 to represent the portion of its associated displays image which is to be shown by its associated LCD panel, and then converts that video signal into signals which are used to drive an LCD display panel 1036 through an LCD driver board 1021, which is represented as part of the Display Panel and Backlight unit 1036 in FIG. 46.

Detailed Description Text (254):
Much of the circuitry shown in FIG. 46 relates to control of the backlighting associated with each display panel. Because the car-top box is designed to be used outside in lighting conditions that can range from the darkness of a moonless night to the brightness of the midday sun, the rooftop box has a flexible and powerful system for backlighting its display panels. Each of the three ganged displays has a separate light sensor 1034 of the type shown in FIG. 42 to sense the amount of light shining on its side of the car-top box. The output of this sensor is fed to a pulse width modulation circuit 1044 that controls the power supplied to the backlighting in the displays associated with the light sensor 1034. The output of the pulse width modulator 1044 passes through a distribution circuit 1046 which splits its pulse width modulation output into three separate paths, one of which is supplied to the power distribution board 1048 associated with each LCD display panel 1036. Each power distribution board 1048 filters the 12-volt power supplied by automobile electric system, and passes the pulse width modulation signal on to the input of the DC inverter 1028. This inverter produces a 2000-volt output that has the same duty cycle as the pulse width modulation signal supplied to it. The output of this DC inverter is used to drive the florescent backlights of the display 1036 at varying levels of brightness depending on the duty cycle of the 2000 volt output of the inverters, which varies as a function of the ambient light on the side of the car-top display in which a given display panel 1036 is located.

Detailed Description Text (256):
In this embodiment of the invention, the illumination generated for each display is controlled as a function of the amount of light falling on its associated light sensor, independently of the amount of light generated for other displays and/or the amount of light falling on the sensors associated with other displays, and is limited to said 1500 NIT limit. In other embodiment the illumination control circuitry 1044A is connected, either directly as indicated by the dotted lines in FIG. 75, or under computer control, to vary the amount of illumination of each display as a function not only of the amount of illumination incident upon its light sensor, but also as a function of the amount of light incident on other light sensors or on the amount of power light being generated by other displays.

Detailed Description Text (257):
This more complicated control scheme allows illumination power to be allocated to a display unit's different displays more efficiently. In some embodiments, if lighting conditions make it appropriate to illuminate one or more displays at a level below the unit's maximum average per-display lighting energy, the energy saved is used to provide more than that maximum average energy to a display that could use it.

Detailed Description Text (259):
-//lf-since the power supply has a max, it may make sense, for example, to

sometimes blackout one display completely (because there is so much incident bright light shining on it that you can't supply it with enough power anyway--so cut your losses and feed the power to the other surfaces so at least they look good).

Detailed Description Text (261):
-//could allocate power based on which display is considered to have better viewership, such as if on highway, or if at high speed, or if demographics say otherwise -//lf-ed, i think we can also claim (though we are not implementing it yet) a separate architecture: the system reads the readings from each of the sensors at each of the ganged displays and optimally re-distributes the power to the 3 displays-//lf-since the power supply has a max, it may make sense, for example, to sometimes blackout one display completely (because there is so much incident bright light shining on it that you can't supply it with enough power anyway--so cut your losses and feed the power to the other surfaces so at least they look good). -//limit on total power consumption by displays, system determines temporary max allowed to individual displays as function of total power limit, equalizing, for example, percent of desired illumination

Detailed Description Text (272):
FIGS. 54 and 55 illustrate how two displays 1062 could be fitted on into a car-top box similar to that described above with regard to FIGS. 42 and 43. In the embodiment shown in FIGS. 54 and 55 only two external displays are provided in the car-top box each of which, has a length parallel to the length of the vehicle upon which they are mounted. In FIG. 54, the numeral 1066 shows where the electronic components of the car-top box could be mounted in such a display. Those skilled in the design arts should realize that other configurations of displays similar to the displays 1060 could be fitted into a car-top box, including those with a generally triangular shape roughly equivalent to that of the car-top box shown in FIGS. 42 and 43, as well as those having four displays, with one such display mounted on each side of a rectangular shaped car-top box.

Detailed Description Text (274):
In other embodiments of the invention, other means could be used to capture sunlight for use in backlighting outdoor display. This could include the use of mirrors, instead of lenses, to deflect sunlight onto the display's defuser surface 1064 or directly onto the back of the display's one or more panels 1036. In some embodiments of the invention which use transreflective displays, a combination of both traditional reflective surfaces which are close and parallel to a display's light valve, and the non-parallel reflective surfaces shown in FIGS. 51 and 56, could be combined into one display. In some embodiments, the mirrors or light reflecting surfaces could be movable under the control of a computer so as to keep sunlight reflected in the proper direction as the sun and/or the display moves. For example, a MEM device having thousands of separately electronically positionable mirrors could be used to help direct sunlight into a backlighting system of the general type discussed above with regard to FIGS. 51 through 56. In some embodiments, differing combinations of one or more lenses, mirrors, and/or non-specular reflecting surfaces could be used to direct illumination to one or more displays as desired. FIG. 57 shows programming 1070 of the central system that relates to a system in which drivers are paid as a function of the amount of money earned by the messages displayed in their mobile units. Such a system could be used in a taxicab, but it also could be used with private vehicles which are supplied with car-top units, or other external displays.

Detailed Description Text (279):
The information transmitted in step 1078 can be transmitted to the mobile vehicle so that it can be shown to the driver on the driver display 386, as illustrated at numeral 1276 in FIG. 63. In many embodiments of the invention, this information will also be made available on the central system's web site so that before a driver enters his car he can plan a route that will help earn her or him the most money.

Detailed Description Text (282):
FIG. 61 illustrates how information from cameras such as those shown in FIG. 60 and that discussed above with regard to FIGS. 33 and 34, can be used to develop demographic data as a function of both time and location. As illustrated in FIG. 61, image information from a mobile unit 104 or a fixed display 346 is transmitted through a wireless system, indicated by the wireless tower 134 shown in that figure, from whence it is transmitted over a communication network, such as the Internet or a phone network 348 to the central system's computers 102B, shown in FIG. 61.

Detailed Description Text (283):
The image data transmitted from the mobile unit 104 or the fixed unit 346 preferably has already had machine vision performed upon it so as to extract current demographic data from the images obtained by the cameras 380 or 380A. In some embodiments of the invention, however, actual images can be transmitted to the wireless network and to the central system and machine vision can be performed upon it by the central system.

Detailed Description Text (293):
As a mobile unit 104 moves through geographic space it radios its location and the identity of the messages it displays to a wireless network, represented by the wireless tower 134 in FIG. 63. The wireless network communicates that information to the central system. This enables the central system to determine a space-time path 1258A through the price-location-time database. A sum of values along such a space-time path, such as the sums represented by the graphs 1274 of 1282 in FIG. 63 can be calculated for each of the paths. The value associated with a given time-location combination in this sum calculation can be multiplied by the number of messages shown in that location, or the amount of time spent displaying messages in that location. In the case of a sum calculated for an advertiser, the advertiser will only be charged for the display of messages which it has agreed to pay for, and not for the display of messages for other advertisers. In most embodiments, the sum calculated for crediting toward a mobile unit operator will give that operator credit for all messages displayed on his vehicle.

Detailed Description Text (296):
As is shown in that figure, the mobile vehicle 104 transmits wireless messages to a wireless network having a multiple receivers 134A through 134C. Electronic comparators 1290 associated with the wireless network can compare information about the receipt of the same signal from the mobile unit by the network's different receivers in a step 1292 to determine the location of the mobile unit. Once this determination is been made a step 1294 can communicate that location information to the mobile unit 104 and/or to the central system 102B. The comparison in step 1292 can be of differences in signal strength received at the different wireless receivers, or of differences in the time at which a given signal is received by such different receivers.

Detailed Description Text (297):
At the time of the writing of this application, it is expected that within several years standard digital wireless communication networks, such as those which will be used by cellular phones and personal digital assistants, will determine the location of wireless transmissions as a standard part of their service. Once such location detection becomes a standard part of wireless service, it may no longer be necessary or desirable for mobile units 104 to contain global positioning systems or other geographic location detection equipment.

Detailed Description Text (309):
Steps 1348 through 1362 describe operations which the central system takes in response to the receipt of shown-message information from individual display units which those display units have generated in response to the steps of FIG. 66.

Detailed Description Text (320):
Returning now to FIG. 65, the central system receives shown-message information from each of a plurality of display units over its wireless communications interface, as indicated by step 1348.

Detailed Description Text (327):
In step 1360, the central system uses the viewers-of-type number associated with a shown-message record to calculate the charge to be made to the order's customer as a function of the price associated with exposures to viewers of the current viewer type.

Detailed Description Text (334):
The roof top display unit 174A is similar to the car-top unit 174, described above with regard to FIGS. 3-6 and FIGS. 42-46. Like them it has two side displays and one back display placed in a triangular arrangement.

Detailed Description Text (336):
The enclosure, and the components it contains, form a rooftop box 1401. This box is designed to be mounted above a roof protector 1408. The roof protector has a bottom surface 1409, which can be seen in FIG. 68, that is shaped to fit the 3-dimensional shape of the roof of the car on which the rooftop unit is designed to be mounted. The roof protector is designed to spread the weight of the rooftop unit over a relatively large area (at least two square feet and preferably more) of the roof of the vehicle on which it is mounted. Such spreading of the rooftop box's weight is valuable, because the roofs of many vehicles are made of relatively thin sheet metal, which cannot support much weight if that weight is applied to a relatively small area of such sheet metal. This is particularly true if the vehicle is to travel on streets having pot holes and other bumps which will cause the force exerted on the roof by the mass of the rooftop box 1401 at certain moments to be even greater.

Detailed Description Text (338):
In the exploded view of FIG. 68 part of the electronic components 1410 of the rooftop unit are shown between the top cover 1404 and the bottom cover 1406. These components are similar to those shown in FIGS. 42 and 43, although in newer versions the computer and related electronics are somewhat smaller and more integrated, a trend that should continue even further in the future. Also in the embodiments shown in FIG. 68 the light sensor 1034 associated with each ganged display is located in a slightly different position than in FIG. 42. Of course in other embodiments, each displays light sensors could be in yet other positions, or a plurality of light sensors could be used for each display.

Detailed Description Text (355):
As can be seen from FIG. 75, the rooftop box includes a computer 140A that is generally similar to the mobile unit computers, or controllers, 140 shown in FIGS. 1, 7, 20, and 21. In FIG. 75 some of the relatively standard components of the computer 140A are shown. These includes its central processing unit, or CPU, 1460; its bus 1462, which enables the CPU to communicate other components of the computer; its random access memory, or RAM, 158A; its hard disk 158B; its video interface 1040C; its I/O ports 1466; and its network interface 1468.

Detailed Description Text (358):
In some embodiments, the illumination control circuit 1044A determines the brightness of its associated ganged display 142 or 144 in response to the output of its associated light sensor 1034 independently of the operation of the other gang displays and their light sensor or illumination control circuitry. But in other embodiments the operation of the illumination control circuits is interconnected, as is indicated by the dotted line 1045 in FIG. 75. Such functional dependence, can be controlled either by circuitry or programming within the illumination control

circuits themselves, or under control of the rooftop box's computer 140A.

Detailed Description Text (359):
Such interdependent illumination control allows illumination power to be allocated to a rooftop box's different displays more efficiently. In some embodiments, if lighting conditions make it appropriate to illuminate one or more displays at a level below the unit's maximum average per-display lighting energy, the energy saved can be used to provide more than that maximum average energy to a display whose visibility could benefit from greater illumination.

Detailed Description Text (362):
FIG. 75 represents one or more heaters 1472 which are located inside the rooftop-box, as well as the inflow and outflow fans 1434 and 1438 which have been described above with regard to FIG. 72. The rooftop-box also includes one or more heat sensors 1470, the output of which is supplied to the computer 148. The computer can control the operation of the heaters and fans in response to the output of the heat sensor.

Detailed Description Text (363):
The computer 140A includes in its memory storage system, which in the embodiment of FIG. 75 includes the RAM 158A and the hard disk 158B, an operating system 160A, wireless remote access programming 160B, vector-based animation program 161; wireless network interface programming 160C, as well as display message programming 160D, and display message storage 166 of the type described above with regard to FIGS. 1, 7, 20, and 21.

Detailed Description Text (366):
The battery's positive terminal is connected through a fuse box to a line 1492, which is connected to a terminal 1493 on one end of the switched path of a watchdog circuit 1494 located in the rooftop box 1401. The other end 1495 of the watchdog circuit's switched path is connected to a line 1496 that supplies power to the rooftop box's computer 140A. The Watchdog circuit has a input 1498 which is connected to the ignition line 1484 and also has another input 1500 connected to an output line 1502 from the computer 140A.

Detailed Description Text (367):
The watchdog switch makes a connection across its switched path between terminals 1493 in 1495 when it senses that power has been supplied to the ignition line. Once this connection has been made the watchdog circuit keeps its switch path connected until it senses that a watchdog timeout period longer than several minutes has elapsed without receiving a watchdog signal on line 1502. When the computer 104A is on and functioning properly it generates such watchdog signals at a frequency higher than the watchdog timeout period.

Detailed Description Text (368):
Thus, it can be seen that the Watchdog switch cause the computer to receive power from when the ignition switch is turned on until the computer stops working.

Detailed Description Text (369):
The computer receives an input from the ignition line 1484 so that it can tell if the vehicle's ignition is on. It is programmed to shut itself off if a sufficiently long period of time has elapsed since it senses that the ignition switch has been turned and remained off.

Detailed Description Text (370):
The positive terminal of the battery 1480 is also connected through the fuse box 1490 to one or more lines 1504 which are supplied to one end 1506 of the switched path of a relay 1505. The other end of the switched path 1508 is connected to line 1510, which supplies power to a set of connectors which comprise a power distribution block 1512. These connectors supplied current to the backlight drive

circuitry 1043, which corresponds to the circuitry 1043 shown in FIG. 46. The power distribution block also supplies current over a line 1514 to one input of the computer 140A, which enables the computer to sense whether or not the backlight drive circuitry is receiving power from power distribution block.

Detailed Description Text (373):
As shown in FIG. 76, the vehicle can have an on-duty switch 1516. This switch is normally placed in the driver's compartment of vehicles which are taxi cabs to enable drivers of such vehicles to indicate whether or not they are on duty. The switch 1516 is connected through a line 1518 both to an on-duty lamp 1520 that is mounted in some embodiments of the rooftop box 1401, and to one input of the computer 140A.

Detailed Description Text (374):
In taxi cab embodiments of the invention, as well as some other embodiments, the driver's compartment is also provided with a panic button, or emergency switch, 1522 which is connected between the positive end of the vehicle's and a line 1524 connected to an input of the computer 140A. This panic switch enables a driver to indicate upon the displays of the rooftop box or over the box's wireless that he is having some sort of emergency, such as a serious breakdown, or a robbery or assault. In other embodiments more complex inputs such as a keyboard, the driver input 392 shown in FIG. 21, or multiple separate emergency buttons, could allow the driver to indicate the particular type of emergency he or she is having.

Detailed Description Text (378):
As indicated by numerals 1542 and 1544 of FIG. 77, at a third, even longer, time after the ignition switch 1482 has been shut off, the computer 140A shuts down. This happens under control of software in the computer 140A that responds to a drop in voltage on the ignition sense line 1484 which is connected to one input of the computer, as shown in FIG. 76.

Detailed Description Text (379):
As indicated at numerals 1546 and 1548 in FIG. 77, shortly after the computer has been shut down by operation of step 1544, power to the computer is shut off. This is done by the watchdog switch 1494 shown in FIG. 76, because once the computer has shut itself off it will cease to emit periodic watchdog signals on line 1502. Once the watchdog switch has failed to receive a watchdog signal from the computer for a period longer than the watchdog timeout period, the watchdog switch will break the signal path between its terminals 1493 and 1495, cutting power to the computer 140A.

Detailed Description Text (380):
In summary, the steps indicated by numerals 1532 through 1548 of FIG. 77 save power by reducing illumination to the rooftop box's displays shortly or immediately after the ignition has turned off. Then, shortly thereafter they turned off all power to those displays so as to prevent the displays from draining too much power out of the vehicle's battery. At a longer period after the ignition has been off the computer 140A shuts itself down under software control, and power to it is cut. The computer 140A draws substantially less electricity than the rooftop box's display backlights, however it draws enough electricity that were the computer left on for long periods of time it would also drain the vehicles battery.

Detailed Description Text (381):
Because of the importance of preventing the rooftop box from inadvertently having its battery drained, in many embodiments of the invention the time-delay relay 1505 is a hardware relay independent of the operation of the computer 140A. This causes the power to be cut from the power hogging backlights even if the computer 140A become hung, decreasing a chance that the vehicle will have its battery rundown accidentally.

Detailed Description Text (384):
As indicated by numerals 1550 through 1554 of FIG. 77, when the ignition switch is turned on power is supplied to boot up the rooftop box's computer. This results from the fact that the watchdog switch 1494 is designed to be triggered to an on, or conducting, state between its terminals 1493 and 1495 when it first receives power from its connection at terminals 1498 to the ignition line 1484.

Detailed Description Text (385):
Then, as indicated at numerals 1556 and 1558 in FIG. 77, power is provided to backlight the displays at a slightly later time. This is because the time delay relay 1550 of FIG. 76 delays its making of a connection between its terminals 1506 and 1508 until the computer 140A has had enough time to boot up and drive images upon the vehicle's displays.

Detailed Description Text (386):
FIG. 78 illustrates some of the energy conservation, temperature control, and a status reporting programming 1516 which can be contained within the computer 140A, shown in FIG. 75.

Detailed Description Text (387):
As indicated by numerals 1562 and 1564, if the computer's connection to the ignition line 1484, shown in FIG. 76, indicates that the ignition is off, the computer records the time at which such an ignition off status was sensed.

Detailed Description Text (388):
As indicated by steps 1566 and 1568 of FIG. 78, if the time since the computer recorded in step 1564 that the vehicle's ignition was off is above a given length, which is longer than the time delay associated with the time-delay relay 1505, step 1568 causes the computer to start shutting down, as was described above with regard to step 1544 FIG. 77.

Detailed Description Text (396):
If the computer receives an input indicating that the panic button 1522 has been pushed, step 1594 causes either the steps under step 1596 or step 1603 to be performed.

Detailed Description Text (400):
Step 1602 repeatedly sends a pre-defined emergency message over the rooftop box's wireless transmitter informing the central system of the emergency state and the vehicle's current location. In some embodiments of the invention step 1602 also sends emergency messages directly to the police or a security service.

Detailed Description Text (404):
In other embodiments of the invention other types of emergency switches can be provided. For example in some embodiments one or more panic buttons would enable a user to separately controlled the generation of emergency messages on its displays and the sending of such emergency messages over its wireless system. In some embodiments the user is provided with controls which allow him or her to indicate the particular time of emergency being experienced, such as whether is a vehicle breakdown, an accident, a medical emergency, or a crime.

Detailed Description Text (405):
Step 1610 through 1626 of FIG. 78 illustrates programming in the rooftop box's computer to enable the central system to better keep track of the operation of the box.

Detailed Description Text (406):
If a rooftop box's computer receives a request from the central system over its wireless communication link requesting a particular type of status report, step 1610 cause steps 1612 and 1614 to be performed. Step 1612 generates the requested

report from the current values of parameters to be contained in the requested type of report, and step 1614 sends the requested report to the central system over the rooftop box's wireless links.

Detailed Description Text (409):
In embodiments, such as those described above with regard to FIG. 64, in which a mobile unit's location can be determined by the wireless network which receives communications from it, status reports from mobile units need not contain a mobile unit coordinates.

Detailed Description Text (410):
The standard status report also include vehicle speed 1650; the size 1652 of one or more of its mass storage devices, such as it's hard disk; the amount of free space 1654 in that mass storage device; the size 1656 of the random access memory in the mobile unit's computer; the amount 1658 of that RAM which is free; and the degree of CPU usage 1660 within the mobile unit's computer. This CPU usage figure can be represented by one or more numbers representing moving averages of the degree of usage of this CPU over one or more recent periods of time, such as the last ten seconds, the last-minute, or the last five minutes.

Detailed Description Text (411):
The standard status report also includes the degree of network traffic 1662 on the mobile unit's wireless system; the IDs 1664 of the currently displayed messages; the output 1666 of each of the mobile unit's light sensors; the amount of power 1668 supplied to illuminate each display; the temperature 1670 sensed by the rooftop box's heat sensor; the power 1672 supplied to the rooftop box's heater; the status 1674 of the vehicle's ignition; the strength 1676 of the signal received by the wireless system 152A (shown in FIG. 75) as detected by a signal strength detector 1469 contained within that wireless system; and the IP address 1678 of the network interface 1468, shown in FIG. 75.

Detailed Description Text (413):
FIG. 82 illustrates a video memory status report 1688 which the central system can ask a mobile unit to generate and send it. In addition to a header 1690 and mobile unit ID 1692, this status report contains a compressed image of the data contained within the video memory of the video controller 1040C in the rooftop box's computer. This enables the central system to see data corresponding to the actual image currently being displayed by each of the rooftop box's displays.

Detailed Description Text (415):
For example, as is indicated at numerals 1616 and 1618, if the rooftop box's computer detects that power to its backlights has been cut, as is described above with regard to numerals 1536 or 1540 of FIG. 77, step 1618 sends a message to the central system informing it of this change and of the time at which it took place.

Detailed Description Text (416):
As indicated at numerals 1620 and 1622, if the mobile unit's computer detects that power to the backlights is been returned after a previous outage, it causes a message to be generated and sent to the central system informing it of this change and of its time.

Detailed Description Text (417):
As indicated at numerals 1624 and 1626, if the rooftop box's computer detects that it's hard disk or other mass storage device is full to a certain predetermined extent, that computer will automatically generate a message to the central system informing it of this change and its time. This enables the central system to generate instructions to the mobile unit informing it of which of its stored display messages it should delete.

Detailed Description Text (418):

In other embodiments of the invention, other information can be obtained from the rooftop box computers in the form of requested status messages and spontaneously generated reports.

Detailed Description Text (419):
FIG. 79 briefly illustrates some of the status monitoring programming 1628 contained in computers of the central system. This status monitoring programming includes remote accessing programming 1632, which enables the central system to gain remote access to functions of a rooftop box's computer's operating system (OS) 168, shown in FIG. 75.

Detailed Description Text (420):
The rooftop box computers 140A contain wireless remote access programming 160B which enables those computers to turn over control of its operating system to the central system in response to messages received from the central system over the wireless communication link after appropriate verifications been made that the attempt to gain such remote access is from a trusted party.

Detailed Description Text (430):
It should be understood that the controller of the mobile unit and the processor of the central system might each actually contain more than one processor in some embodiments of the invention. Furthermore, it should be understood that in some embodiments of the invention the central system might be distributed, and, thus, be made of a plurality of separate computing systems, each with communication capability, whether there is a wireless transmitter and receiver separately associated with each such distributed computing system, or whether they are part of a unified communication system. Preferably in such distributed system all of the separate computer systems will be networked together so that the multiple computer systems can operate as a unit. In some embodiments of the invention, the central system might actually be composed of distributed functionality executed on the computational network formed by the system's plurality of display units.

Detailed Description Text (431):
In the embodiment of the invention shown in FIGS. 1, 7, 20, 21, and 22 the positioning system used in the mobile unit is a GPS system. In other embodiments of the invention, any other currently, or hereafter, known location determining system could be used. As is discussed above with regard to FIG. 64, in some embodiments of the invention the mobile unit need not have a position determining system at all, and the wireless system used by the central system will locate the mobile unit based on information determined from the receipt of that message by various receivers within that wireless system.

Detailed Description Text (432):
In some of the embodiment of the invention described above the locator signals are transmitted by the same wireless system that is used to receive display-selection messages from the central system. It should be understood that in other embodiments of the invention the locator signals could be transmitted by a separate radio transmitter. For example, in some such embodiments the wireless system used for most data communication between the mobile units and the central system could be a cellular system, whereas the locator signals can be transmitted by separate radio transmitters, which is not part of the cellular system. In some such embodiments, the locator signals transmitted can contain little more information than an identification of the mobile unit itself. In such case, the central system will include additional wireless receivers designed to receive and determine the location of the transmission of such locator signals.

Detailed Description Text (433):
In FIGS. 1, 7, 20, 21, and 22 the GPS electronics 146 are shown as being connected to their respective display unit's controller. In other embodiments, the GPS (or other position detecting) electronics could have their output connected directly to

electronics for transmitting the position values they determine to the central system, without having such position value pass to or through the display unit's controller.

Detailed Description Text (436):
According to one aspect of the invention, a computer readable data structure recorded in machine readable memory is provided. The data structure comprises information relating to the number of people available to see a publicly displayed message in each of a plurality of physical locations at each of a plurality of times, including various times of day.

Detailed Description Text (443):
According to another aspect of the invention, a computerized method provides values for demographic attributes as a function of physical location and time. This method involves receiving input data comprising values of one or more demographic attributes at each of one or more given discrete locations in physical space and time, in which the inputs include variations in values over a period at least as short as a week. The method smoothes these values over location and/or time so as to produce a set of values for each of the input attributes which vary at a higher spatial and/or temporal resolution than the input data. The method responds to queries for a given one of the attributes' values at a given location and time by producing such smoothed values for the attribute.

Detailed Description Text (450):
In some embodiments of this aspect of invention the criteria only vary with regard to location, and not time. In others, the criteria vary both as a function of location and time. In some embodiments of this aspect of the invention, the displays are publicly visible displays. In some embodiments at least some of the displays are mobile, causing them to be located at different locations at different points and time. In some embodiments the individual displays have associated with them sensors that are used to help update the demographic database used by the method.

Detailed Description Text (456):
In some embodiments of this aspect of the invention, the number of people used to calculate the charge is a number of one or more particular types (i.e. demographic groupings) of people.

Detailed Description Text (472):
In some embodiments of this aspect of the invention, the selection of which message to show on each of a plurality of said individual display is made by a local computer associated with each such individual display; and the updating of the desired number of remaining exposures for a given message includes communicating information that a given message has been selected to be shown on a given display by the given displays associated local computer to local computers associated with other displays so that those other displays can use the updated desired number of remaining exposures into account when make their selection as to what messages to display on their associated display.

CLAIMS:

1. A system for publicly displaying messages comprising: an automotive vehicle and; the following elements carried by the vehicle: a publicly visible display formed by ganging together a plurality of individual digital displays, each having at least a resolution of 640.times.480 pixels; and mobile controller unit for generating signals to cause images to be shown on said ganged display, using vector-based animation representation with different portions of individual images being shown on each of the individual digital displays.

3. A mobile display system for publicly showing messages comprising: an automotive

vehicle; and the following elements carried by the vehicle: a publicly visible electronic display capable of displaying animated images; a computer having: a mobile controller unit for generating signals to cause animated images to be shown on said display, a memory device capable of storing representations of animated display images represented in vector-based form; and programming for enabling said computer to generate animated images from said vector-based animation representations.

4. A mobile display system as in claim 3 further including a radio connected to said computer for conveying digital information to the computer about which messages the computer should cause to be shown on said display, including information including said vector-based animation representations of such messages.

Previous Doc Next Doc Go to Doc#